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CAPTAIN SIR JOHN FRANKLIN, K^T

K.C.H. K.R.G. D.C.L. F.R.S. &c.

Commander of the Arctic Expedition, 1845

Engraved by Permission of Lady Franklin,

THE YEAR-BOOK OF FACTS

IN

Science and Art:

EXHIBITING

THE MOST IMPORTANT DISCOVERIES AND IMPROVEMENTS OF THE PAST YEAR,

IN MECHANICS AND THE USEFUL ARTS; NATURAL PHILOSOPHY; ELECTRICITY; CHEMISTRY; ZOOLOGY AND BOTANY; GEOLOGY AND GEOGRAPHY; METEOROLOGY AND ASTRONOMY.

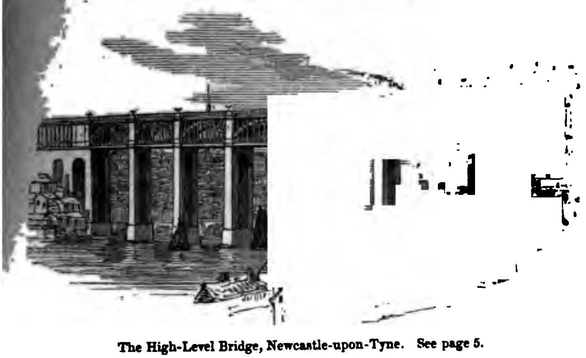
BY JOHN TIMBS,

EDITOR OF "THE ARCANA OF SCIENCE AND ART."

Illustrated with Engravings.

"The step in advance is wide, and the onward progress is rapid. It is not merely that each discovery which is thus freely communicated becomes an imperishable addition to the treasury of human knowledge, but it is also a source of others, more numerous as it is more widely diffused,—like a syngenesious flower, whose winged seeds would produce little if confined to the neighbourhood of their parent, but bear a thousand-fold when scattered over the land."

The Rev. T. R. ROBINSON; PROC. BRIT. ASSOC. 1849.



The High-Level Bridge, Newcastle-upon-Tyne. See page 5.

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CAPTAIN SIR JOHN FRANKLIN,

COMMANDER OF THE ARCTIC EXPEDITION, 1845.

SIR JOHN FRANKLIN,—whose protracted absence from our shores continues to be a subject of painful sympathy,—was born in 1786, at Spilsby, in Lincolnshire. He entered the Navy, Oct. 1, 1800, as a Boy, on board the *Polyphemus*, 64, Capt. John Lawford, under whom he served as Midshipman, in the action off Copenhagen, April 2, 1801. He then, in the *Investigator* sloop, sailed with Capt. Flinders, on a voyage of discovery to New Holland; where, on joining the *Porpoise*, armed store-ship, he was wrecked on a coral rock, near Cato Bank, Aug. 17, 1803. While on his passage home, in the *Camden*, East Indiaman, Mr. Franklin had charge of the signals; and he distinguished himself at the celebrated repulse of a powerful French Squadron, under Admiral Lenois, Feb. 15, 1804.

On his arrival in England, he joined the *Bellerophon;* and, subsequently, under Capt. Cooke, took part in the battle of Trafalgar. On being transferred to the *Bedford*, 74, Mr. Franklin was confirmed a Lieutenant of that ship, Feb. 11, 1808; and escorted the Royal Family of Portugal from Lisbon to South America. During the after-part of the war, he was chiefly employed at the blockade of Flushing: he then, towards the close of 1814, joined in the Expedition to New Orleans; and for his brave conduct, on Jan. 8, 1815, he was officially and very warmly recommended for promotion.

On Jan, 14, 1818, Franklin assumed command of the hired brig, *Trent*, in which he accompanied Capt. D. Buchanan, of the *Dorothea*, on a perilous voyage of discovery to the neighbourhood of Spitzbergen. In April, next year, Franklin was invested with the command of an Expedition to proceed overland from Hudson's Bay to ascertain the actual position of the Coppermine River, and the exact trending of the shores of the Polar Seas to the eastward of that river. This fearful undertaking endured until the summer of 1822, through a journey of 5,550 miles: its perils and adventures, Capt. Franklin, (whose Commander's and Post Commissions bear date respectively 1821 and 22,) has ably described in his "Narrative" of the journey.

In 1825, he left England to co-operate with Captains Beechey and Barry, in ascertaining, from opposite quarters, the existence of a North-west Passage. The results of this mission, which terminated in lat. 70° 24′, N., long. 149° 39′ W., will also be found in Capt. Franklin's Narrative, 1825-27.

On his return to England, in Sept. 1827, he was presented by the Geographical Society at Paris, with a Gold Medal, valued at 1200 francs, for having made the most important acquisition to geographical knowledge during the preceding year. In 1829, at home, he received the honour of Knighthood; besides the Oxford degree of a D.C.L. Sir John Franklin married, first, in 1823, the youngest daughter of William Porden, Esq., architect; and 2ndly, in 1828, the second daughter of John Griffin, Esq., of Bedford Place.

From 1830 until 1834, he commanded the *Rainbow*, 28, on the Mediterranean station; and for his exertions in connexion with the troubles in Greece, he was presented with the order of the Redeemer of Greece. In 1836, Sir John Franklin was created a K.C.H; and was afterwards, for some time, Lieut.-Governor of Van Dieman's Land.

In 1845, Sir John Franklin was appointed to the command of another Expedition to the North—the *Erebus* (Captain Franklin), and the *Terror* (Capt. Crozier)—on a fresh attempt to explore a North-west passage through Lancaster Sound and Behring's Strait. The ships left Greenhithe, May 19, 1845. Little intelligence has been received of this Expedition since the day of its sailing.

At the close of 1847, Government resolved to send out three Expeditions in search of Franklin and his party, numbering 140 souls. The first of these Expeditions, H.M.S. *Plover*, sailed in January, 1848; the second Expedition, the *Enterprise* and *Investigator*, was placed under the command of Captain Sir James Ross, and sailed in May, 1848; the third Expedition (overland) under Sir John Richardson, having left Liverpool about two months previously. In the *spring of 1849, the North Star* left with provisions for Ross' *Expedition; and a reward of £20,000* was offered by Government to any land

or sea Expedition that might render efficient assistance to Sir John Frank his ships, or their crews, and contribute directly to extricate them from ice.

The past year has been one of "hope deferred," as regards the subjec the Franklin Expedition. In the autumn, there dawned a sudden lig though "the time for hope was nearly gone by in all hearts save that of noble-minded wife, who *would not* part with hope." A whaler brough sealed cylinder; but it only contained information of Franklin's ships June, 1845. Another whaler brought a story from the Esquimaux, that ships of both Franklin and Ross' Expeditions were seen beset by the ic Prince Regent's Inlet, as late as March, 1849. In November, Ross' Ex dition returned, and formally negatived the circumstantial story. Aln simultaneously arrived Sir John Richardson; and since has returned *Plover*. Neither of the three Expeditions has brought any intelligence of missing voyager, or his companions!

The public sympathy has been touchingly expressed on the calamit suspense; and prayers have been offered up in between 60 and 70 churc by upwards of 50,000 worshippers, for the preservation and safe return of mising Expedition. A reward of upwards of one hundred guineas has t promised to any of the whaling-ships which may bring information of voyagers; and Lady Franklin has offered £2000 to induce whalers to m search in parts not within the scope of the Government Expedition.

We should acknowledge that the preceding details of Sir John Frankl early services have been mostly derived from O'Byrne's *Naval Biograph Dictionary*, published during the past year.

At the time we write, (January 24, 1849,) the *Enterprise* and *Investig* have again left England in search of the gallant Commander and his a ciates in the great work of civilization and science; and may God gra happy issue to their labours of peril!

CONTENTS.

THE

YEAR-BOOK OF FACTS.

Mechanical and Useful Arts.

THE HIGH-LEVEL BRIDGE, NEWCASTLE-UPON-TYNE.

(*See Vignette, in title page.*)

THIS magnificent structure across the Tyne forms the important junction between the York and Newcastle, and the Newcastle and Berwick, Railways. It was projected by Mr. Hudson, M.P.; and has been designed by Mr. Robert Stephenson, M.P., engineer,; Mr. T. E. Harrison being the resident engineer, and his assistant Mr. Hosking; Messrs. Rush and Lawton, and Messrs. Wilton and Gibson, being the contractors for the mason-work; and Messrs. Hawks and Crawshay, for the iron-work.

The bridge extends from the Castle garth, on the north, to the high ground on the south side of the river; there being two roadways, one level with the Castle garth, for carriages and foot passengers; and the other at an elevation of 22 feet above it, with three miles of railway for locomotives. The carriage road is 1380 feet in length, on a straight line, and the locomotive way immediately above; with the exception of a space at each end, where a portion diverges to the railway stations; these portions being supported on a handsome colonnade of metal pillars.

The bridge is 112 feet 6 inches high from high-water line to the top of the parapet, and the roadway is stated to be 80 above the water. Six arches, each of 125 feet span, form the bridge. The piers are of masonry, and the arches, pillars, braces, and transverse girders, of iron; the balustrades of the rail and coach roads are also of iron. The roadway is 20 feet 4 inches wide, 20 feet high; and there are footways on either side between the great ribs of the arches, each 6 feet 3 inches in width.

The bridge-piers are 48 feet by 16 feet 6 inches in thickness, and in extreme height are 131 feet from the foundation, having an opening in the centre through each. These piers are built on piles, piercing the bed of the river, about 50 feet on the north side, and 20 feet on the south. The land arches of the bridge diminish in altitude from the foundation upwards, corresponding with the steep bank of the river basin.

The roadway for carriages and carts beneath the railroad forms one of the most striking and novel features in the design. This roadway is suspended from the great arches which carry the railroad; and it is impossible to imagine a more interesting and beautiful sight than this road from the huge span of the arches, diminishing in perspective, and

the opening at the farthest end of the bridge, showing only like a bright spot in the distance. The pillars which carry the roads add greatly to the picturesque effect; and the multiplicity of column ribs, transverse and vertical braces, produces such a combination of beautiful lines as is seldom seen on bridges or similar erections.

This is stated to be the first bridge in which the suspension and ordinary principles of a viaduct have been combined in one structure. It serves a two-fold object: a bridge to accommodate Newcastle and Gateshead, at the same time that it carries the railway lines above.

THE BRITANNIA TUBULAR BRIDGE.

IN the *Year-book of Facts*, (p. 5 and 6, 1849,) will be found the leading dimensions and other details of this vast work. We have now to record the *Floating* and *Raising* of the Tubes, which have been accomplished within the past year.

Mr. Stephenson's arrangements for the floating of the first tubes may be thus briefly described:—During its construction on the platform, the rock beneath it at the end was excavated, so as admit eight pontoons furnished with valves, which would let in or keep out the water, as described, and float 3200 tons; whereas, the weight of the tube, with its apparatus, was but 1800 tons. Communicating with these pontoons, on the Anglesey and Carnarvon shore, at the Britannia Rock, was provided a series of capstans, the ropes and hausers to which exceeded two miles in length; the two largest of which were attached to the tube for guiding it to the feet of the Anglesey and Britannia Towers; whilst the smaller ropes were to be used to coax the huge tube to its resting place.

Wednesday, June 27, 1849, was the day fixed for the floating. There were present Mr. Bidder, Mr. Brunel, Mr. Locke, Mr. Vignolles, and other eminent engineers; with Captain Moorsom, R.N., and Capt. Claxton, late of the *Great Britain* steamer; besides Mr. Robert Stephenson, Mr. Edwin Clark, Mr. Latimer Clark, Mr. Forster, the engineers of the vast Tube Bridge. The event of the day attracted many thousands of spectators to witness so gigantic a feat. The great work was commenced by the pontoons (the valves of which had been closed), rising with the tide, and receiving the tube from off the platform, on their gunwales: it was, however, still held by the hausers, till Mr. Stephenson gave the command, "Cut the land attachments!" This was done by carpenters with axes, and the tube floated into the water; its pace being regulated with the capstans and guide-hausers by Mr. Brunel and Mr. Locke: Mr. Stephenson, who was stationed on the tubes denoting that the speed should be increased or diminished, by horizontally raising his arms, or slowly depressing them; whilst other orders were given by exhibiting large wooden letters, and waving differently coloured flags, from the roof of the tube. The whole of the operations were under the command of Mr. Stephenson, assisted by Capt. Claxton.

At half-past nine—little more than an hour and a half from the time of floating—the tube had not only been got across the Straits, but was announced by a signal to be at its resting-place between the two others, on the Anglesey side. The eastern end of the tube was first inserted into the vertical recess of the Britannia Tower, formed for its reception; and the down-coming tide from the northward floated the other end into its place, a similar recess in the Anglesey Tower, a portion of the tower-mason-work being there omitted for its reception. As soon as the tube was deposited, the pontoons were got from under it. There were employed in the removal, 100 seamen from Liverpool, besides 700 other workmen.

The next labour was the Lifting of the Tube. The apparatus for this purpose was composed of three Bramah's hydraulic presses, each consisting of a large and heavy iron cylinder, like a mortar; a strong piston or plunger, also of iron, called the ram, which worked up and down inside the cylinder, and was fitted with a leather collar at the shoulder, so as to be water-tight. An

ngly thick and heavy beam of cast iron, strengthened by wrought-iron ross the top, rested like a yoke upon the shoulder of the ram; it is :he cross-head of the press. Two chains passed through square holes :r end of the cross-head, and were securely gripped at the top of it by aratus called the *clams*, consisting of two strong cheeks of wrought- rawn together by screws, like a blacksmith's vice—the shoulders of ks being made square, so as to afford a secure hold between the clams. hydraulic press stood on two massive beams, composed of wrought- ates; and to steady the action of the cross head, when rising, two guide ere fixed into the head of the press, and into a beam twelve feet above ss. The power of the press was exerted on the tube by aid of chains, ks of which were six feet in length, bolted together in sets of eight ne links alternately; and as the ram raised the cross-head six feet troke, when that height was attained, a lower set of clams, on the gripped the next set of links, and thus prevented them from slipping whilst the clams on the cross-head were unscrewed, the upper links off, and the cross-head lowered to take another stroke. The cylinder paratus on the Anglesey pier were of prodigious size, strength, and . In length, the cylinder was 9 feet 2 inches; outside diameter, 3 feet s; and the ram 1 foot 8 inches in diameter; the whole weighing above ons, being, in fact, the most powerful machine ever constructed. The f the cylinder were eleven inches in diameter, and the pressure it was ted it would resist, was eight or nine thousand pounds per square inch; was considered alone capable, if worked to its full extent, of raising e, a weight of eighteen hundred tons. The two hydraulic presses in tannia pier were capable of sustaining enormous pressure, each having wer to lift about 1296 tons.

water was forced into the presses by two steam-engines of 40-horse with tubular boilers, as in a locomotive. The steam-cylinder was ntal; a continuation of the piston-rod, which passed through both f the cylinder, formed the pistons of the force-pumps, which were one at each end, in the same line as the cylinder. The diameter of mps was one inch and one-sixteenth; that of the ram of the hydraulic- wenty inches; their respective areas being in the proportion of one to undred and fifty-four. The pipe through which the water was forced e press was of wrought-iron, and was much smaller than would be ed, not being more than half an inch in diameter. These steam- s were placed in the Anglesey pier and Britannia tower respectively.

e presses were constructed by Messrs. Easton and Amos, engineers, ark. The largest press had power enough to lift the whole,—a weight, timated, equivalent to that of 30,000 men. It would spout the water l into its cylinder to a height of nearly 20,000 feet, according to Mr. or more than five times the height of Snowdon, or 5,000 feet higher lont Blanc. And yet any one man, with the utmost facility and preci- ould guide and control this stupendous action. The chains descending tube below are like those of an ordinary suspension bridge, in eight ne links alternately. The weight of one of these alone was about 100 r more than that great "lift," the Duke's statue, at Hyde-park Corner. work of lifting was commenced by the boiler of the steam-engines sufficiently heated, when the great piston, pressed upward by the water h it, rose, until in thirty minutes the tube was lifted at one end six nd then secured. It was the original intention of Mr. Stephenson, once begun to lift, to do so at both ends simultaneously, and so to e making consecutive lifts as fast as possible, by which the whole have been accomplished in about eighteen hours; but the terrible con- ce of any failure in the chains, during the time when the dead weight have been hanging on them, made him adopt a slower method, by one lift of six feet was made in the twenty-four hours, first at one end en at the other; the tube being followed up underneath by wood gs, which during the remainder of the day were taken out and re- by solid masonry. The lift took on an average 38 minutes. The on was begun on Friday evening, August 10, and the whole height l by August 16, was 27 feet; everything having hitherto proceeded t the least impediment or failure.

On August 17, the engineers renewed their labour for another 6 feet: the tube rose steadily to the height of 2 feet 6 inches, being closely followed up by the packing; when suddenly, and without any warning, the bottom of the hydraulic press gave way, separating completely from the body. The ram, cross-head, and chains, descended violently on to the press, with a tremendous noise—the tube sinking down upon the wooden packing beneath it; while the bottom of the press, weighing nearly 2½ tons, fell on to the top of the tube, through a depth of 80 feet. A sailor, who was ascending from the tube to the pier, but was not engaged in the raising, was struck by a piece of the broken press; when he fell on to the tube, a height of 50 feet, and was so severely injured that he died the next day.

The tube was not at all injured in the above accident, but some of the lifting-frames were broken; these being repaired, the raising was resumed, and the final lift of the tube was successfully accomplished on October 15. It was then 3 feet above the permanent level, so as to enable the engineers to join it on to the end or land tube, before laying it down on its bed-plates and permanent rollers placed beneath it; these rollers being requisite to enable the iron to expand and contract according to the variations in the temperature of the weather. This operation occupied about three weeks, when the tube was finally lowered.

The hydraulic press and lifting apparatus were then removed from the Anglesey to the Carnarvon shore, for the raising of the next large tube: this was successfully floated on December 4; the raising was commenced on December 18; both operations being conducted precisely as on the Anglesey shore, but without the interruption of any accident.

In one of Mr. Stephenson's Reports it is stated that some delay had arisen from unsoundness in one of the large castings of the new hydraulic press in the Anglesey Tower, which occasioned so much leakage, as threatened to render a new casting necessary; that the leakage, however, had been stopped.

This Report also states the adoption of lifts by short stages, and the building up, step by step, underneath with brickwork, to guard against accident; for, after the fracture that took place in one of the cross-heads during the lifting of the Conway tubes (fortunately discovered in time to prevent a very serious disaster), the utmost caution was deemed expedient. The issue proved the great necessity of such prudence and caution. The lower part of the defective cylinder burst, as above described; and the precautionary packing and bricking, with cement, under the tube, alone prevented the most terrible consequences.

We subjoin a few interesting data of this stupendous work.

Sir Francis Head, in an able description of the works in the *Quarterly Review*,* compares each of the large tubes to a street or row of chimneyless houses; allowing it to have skylights in the roof, it would resemble the Burlington Arcade in Piccadilly; the labour of placing the tube on the piers has been assimilated to raising the Burlington Arcade upon the summit of the spire of St. James's Church, if surrounded with water.

Mr. Stephenson states that no less than a million and a half of cubic feet of masonry, of which the piers and abutments are composed, have been constructed within three years; and three cubic feet have been accomplished per minute, since the commencement.

Sir F. Head describes the plate iron covering of the tube to be internally not thicker than the hide of the elephant, and scarcely thicker than the bark of an oak-tree. One of the large tubes if placed on its end in St. Paul's Church-yard, would reach 107 feet higher than the cross of the cathedral.

The Britannia Bridge lies about a mile distant from Telford's Suspension Bridge, which, on careful examination, is stated to be in as perfect a state as when first opened.

The works of the Britannia Bridge have been carried on for several months, both by day and night, under the superintendence of Mr. E. Clarke, the resident engineer, and Messrs. Forster and Wild; and the first line of tubes is expected to be opened for traffic on the 1st of March next.

* "A General Description of the Britannia and Conway Tubular Bridges," has been published by "a Resident Engineer." A Large Work on the subject, with Diagrams, and a folio volume of Plates, is announced for publication, by subscription, by Edwin Clark, Assistant Engineer.

STERIOLAIC BLACK CLOTH.

r "finish," applicable to all woollen cloths, but of peculiar ; in Black Cloth, has been recently introduced by Messrs. Wilson, of St. Martin's-lane, Charing-cross. During the ears, the decline of our woollen trade with the United States rapid and marked; the cloths of Belgium and France having at period almost entirely taken the market from us, in con- of the superiority of the dye and finish. The first effort ıanufacturers to meet the competition was lowered prices. ths were mixed in the manufacture with waste and flocks, with logwood instead of indigo or woad: the first cost was that of the continental cloths; but our fabrics were soon ›m their inferior wear, to be in the long run the dearest.

!4, a new finish for fine cloths was adopted in England, smooth gloss, the attainment of which, however, seriously the texture and durability of the fabric. In the home ll cloths therefore came to be preferred, the dulness being strength; but in foreign markets the chief demand con- be for the bright-surfaced cloths.

many and France, a mode of finish was adopted giving the surface, not only without injury, but with actual benefit to ; ; for these foreign-finished cloths would neither stain nor rain, nor hold dust so easily as ours. They looked well well, and gradually gained a firm footing, especially in the . market. The recently adopted Steriolaic finish, above re- enables us to produce a cloth superior in every respect to ar continental rivals, and at a lower price than they have ›d. The improvement commences with the very first step anufacture; the wool is more thoroughly picked and washed. used for the foundation of the dye, and by a peculiar appli- is made cheaper to dye with it than even with logwood. : cloth so dyed is turned red by the application either of or muriatic acid; it does not fade nor rub white at the The finish is produced by a machine, improved from the and which we are prevented from describing, because it is urse of still further improvement. The cloth finished by ›ses its glossiness; it feels peculiarly rich and soft, and even ;hly soaked with wet, retains after drying its lustre.

V MODE OF PREVENTING ACCIDENTS IN COAL MINES.

mode of preventing those dreadful explosions of fire-damp e so continually occurring in our Collieries, has been by Mr. Isham Baggs, and is confidently stated to be of great saving of human life. It is based upon unerring chemical ical principles, and it affords to the working miner, at any nstant of time, a sure index to the presence of fire-damp, precise degree of danger pertaining to the atmosphere by is surrounded. The arrangement is placed at the top of the *ie principle of its action* will be easily understood from the

following explanation. By means of a single acting pump, a portion of the air which is ascending the up-cast shaft of the mine, is being continually blown through a strong metallic vessel, the capacity of which is 20 cubic inches; and whenever it is required to test the atmosphere of the pit, the two stopcocks communicating with this vessel are closed, and the blowing is suspended. One cubic inch of fire damp is then, by means of a small pump, drawn from a bag or bladder, and introduced into the metallic vessel. A fine wire of platina, placed within this vessel, is next ignited by making contact with an adjacent voltaic battery. If the atmosphere of the mine be tolerably pure, no effect is produced, for a mixture of 1 volume of fire-damp with 20 volumes of atmospheric air is inexplosive; but if the air which is ascending the upcast shaft, (and of which the enclosed portion is a sample), should happen to contain but the one-fortieth part of inflammable gas, this small portion, added to the one-twentieth artificially introduced, will constitute a mixture of 1 in 13⅓, and a flash will consequently take place; which, communicating with a little gunpowder, is either made to fire a cannon, explode a maroon, or give some other loud signal of approaching danger. The invention is only intended to afford indications of the general atmosphere of a mine, with a view to the prevention of accident, and it does not pretend to guard against the local effect of *sudden* blowers.

Our readers will find further details, with an illustrative diagram, in the *Mining Journal* for January 19, 1850.*

EXHIBITION OF RECENT BRITISH MANUFACTURES AT THE SOCIETY OF ARTS.

On March 7, was opened this display, which is considered to have been the most promising collection of objects of home production yet assembled at any Art Exhibition. The *Athenæum* report states, the main particular in which this exhibition so far surpassed its predecessors, was in the principle of selection that characterizes it. While there was much more that was beautiful, there was infinitely less that is bad. Yet, what there was of poor design, was so wretched by the side of the beauty, as to clearly demonstrate that the fault does not rest on the head of the artists and manufacturers who have contrived to produce so many and such graceful works of Art; but on that of the public, who will still continue to cling to deformity if sanctioned by precedent.

Among the attractive objects was a "Gilt Centre Piece," executed by command of Her Majesty, from a design by His Royal Highness the Prince Albert, lent for exhibition by Her Most Gracious Majesty. On the lower compartment are "portraits of the favourite dogs belonging to Her Majesty, modelled by E. Cotterell, and manufactured by Garrard and Co."

Among the many beautiful objects exhibited were the bronzes of Mr. Hatfield; the exquisitely dyed and woven silks of Messrs. Walters; the admirable racing-plate made by Messrs. Hunt, Roskill, and

* See also p. 61 of the present volume.

Garrard; the carpets of Messrs. Watson and Bell; the glass of Messrs. Osler, Richardson, and Pellatt; and the greatly improved castings of the Coalbrookdale Iron Company. Among the designs submitted in competition to the Society were many of considerable beauty, and the preparation of which must have involved great sacrifice of time and labour.

EXPOSITION OF ARTS AND MANUFACTURES AT PARIS.

THE Eleventh Exposition was opened at Paris during the past year, in a vast building erected for the occasion. A valuable Report on the Exposition has been published by Mr. M. D. Wyatt, who was commissioned by the Society of Arts to visit Paris, "for the purpose of collecting all such details concerning the quality, extent, and general character of the Exposition, as might seem most deserving of the careful attention of the Society." From this Report we gather that machinery was the great and predominant attraction. There was a dazzling array of pretty and tasteful objects. Evidence was exhibited on all hands of the extent to which the education of French workmen has been carried. Scarcely could be recognized a piece of bad ornamental modelling; where the human figure was introduced, it was rarely ignorantly drawn. In the tender manipulation of jewellery, carving, tooling, &c., could ever be recognized a practised hand acting in unison with a thoughtful head.

The only important branches of manufacture in which, to judge from the present exposition, France seems decidedly behind England, are those of the application of mechanism to carving on a large scale, the manipulation of gutta percha, tin-plate and Britannia-metal working, earthenware, and japanning on papier-maché; and generally, perhaps, in her immediate adaptation of new machinery to facilitate, and consequently cheapen, production; while in many departments—such, for instance, as the cultivation of the art of enamelling, of bronze-working, of the production of artistic stoneware, the making and colouring of terra cotta, and of riband and silk weaving and dyeing, —she appears decidedly in advance. It may, perhaps, be well to remind those interested, that the predominating feature of this exhibition in France was the manifestation of her power to get up those machines on the possession of which our facility in production has long depended.

EXPOSITION OF MANUFACTURES AT BIRMINGHAM.

A SPLENDID Exhibition was opened at Bingley House, Birmingham, in September last, on the week prior to the Meeting of the British Association in that town.* Among the more striking productions exhibited, were the specimens of glass manufacture which has, of late years, received such great impetus from the cessation of governmental interference. Messrs. Osler's specimens included a splen-

* The Nineteenth Meeting of the British Association for the Advancement of Science, commenced at Birmingham, on Wednesday, September 12, 1849.

did candelabrum, about 20 feet high, its shaft, with 30 branch being entirely of crystal-glass. Mr. Rice Harris exhibited seve beautiful works in coloured glass; and Messrs. Richardson many f specimens of graceful form, brilliance of colour, and elaboration ornament, the engraving and cutting of which were exquisite. T specimens by Messrs. Bacchus, Lloyd, and Summerfield, were a highly distinguished by their labour and skill. Optical, flint, a crown glass, remarkable for its size, transparency, and volatility, v contributed by Messrs. Chance and Co., of West Bromwich; a stained and painted glass, (now in general demand for new church was excellently represented by Chance, Lloyd, Summerfield, a Pemberton. The specimens of plate-glass, by Mr. Lacey, were fi and, among many novel applications of the manufacture, were pro nent the glass water-pipes by Coathupe and Co., well adapted for more cleanly conveyance of water, than by iron and other tubes.

The works in metal were, as might be expected, very numero The bronzes exhibited a great advance in their artistic excellence. church furniture in metal there was a large stand of brilliant spe mens by Messrs. Hardman.

The exposition was altogether a magnificent display of the B mingham manufactures. It was carefully inspected by the memb of the British Association; by His Royal Highness Prince Albert, a visit to Birmingham for the purpose; and by many thousands visitors from all parts of the kingdom.

FRENCH INDUSTRIAL EXPOSITION IN LONDON.

In November last, a large collection of specimens of the indust arts of France was opened at 13, George-street, Hanover-square, a proved very attractive as an exhibition. It was arranged under direction of M. Sallendrouze de Lamornaix, ex-deputy and mem of the Acting Council of Manufactures at Paris, and himself one the largest and most distinguished manufacturers of France. T articles exhibited, it was understood, were the property of a body manufacturers, and included a selection from the late National E position at Paris; out of which, and our own projected "Gr Exhibition of the Works of Industry of all Nations," in 1851, anticipatory assemblage of M. Sallendrouze de Lamornaix doubtl originated. It was not, however, strictly speaking, a National E hibition, as our forthcoming one will be; but when we say that contained some exquisite works from Sèvres, the Gobelins, and Be vais, and the ancient Royal carpet manufactory of Aubusson, reader will conclude it to partake largely of a national character.

The several articles were arranged in a suite of seven rooms, besi galleries, staircases, and corridors: containing bronzes and other namental metal-work, of exquisite design and perfect finish; cos cabinet-work; Sèvres porcelain, admirably painted and embellish bookbinding, with which the illuminated missals of mediæval tin *cannot* be compared; tapestry from the looms of the Gobelins; c *pets from Aubusson*; silks, satins, and velvets from Lyons; pa

pattern of extraordinary beauty in design; lacework and cashmere shawls; specimens of jewellery; and last, though not least remarkable, boots and shoes, in the soles of which sewing is dispensed with.

The contents of the fourth room, though not showy, are entitled to special notice, from their novelty. They consisted of specimens of ornamental mouldings in laminated zinc, by the "Société des Zincs de la Vieille Montagne," which gained the large gold medal at the late Paris Exposition. Another object in this room worth notice is a new machine, exhibited by M. Schlumberger, of Mulhouse, for carding wool. It appears to act with great ease, and in a very effectual manner, and is stated to card from 50 lb. to 60 lb. of wool in the day.

GREAT INDUSTRIAL EXHIBITION IN 1851.

A VAST Exhibition of specimens of the industry and ingenuity of the whole world will take place in London, in the year 1851. This gigantic project is entirely the suggestion of His Royal Highness Prince Albert, as President of the Society of Arts. It is proposed to be held in Hyde Park, in a building to be constructed for the purpose, a mile long, at an expense of £100,000. Prizes are to be given, from £5,000 downward, to the value of £20,000. The total expenses are computed at £200,000, which sum is to be raised by voluntary contributions. The management of the exhibition is confided to a Royal Commission, of which Prince Albert is President; and it is understood that Her Majesty will probably herself dispense the prizes. The exhibition is to include all the best specimens of human skill and industry, and raw material, from all parts of the world. This grand plan is already in active organization; and public meetings have been held in the principal manufacturing towns in England, at which the proposition has been most enthusiastically received. The subscription list has been headed by Her Majesty with the munificent gift of £1000; the Royal President, Prince Albert, contributing £500.

RAILWAYS AND CANALS.

A COMPARISON has been made of the relative advantages of Railways and Canals, in a provincial paper. The writer calculates the degree of resistance a carriage or vessel meets with, either from friction or the pressure of water, in each of these modes of conveyance. From these calculations it appears that a horse will draw a load ten times as great upon a railway, and thirty times as great upon a canal, as he will upon a good road. When the horse moves at the rate of two miles an hour, therefore, a canal is the most advantageous mode of conveyance; but when the speed is increased, the case is very different.

With regard to the expense, the writer estimates the cost of a railway at three times the cost of a good turnpike road, and that of a canal at about nine or ten times. If railways, therefore, should come into general use, two-thirds of the expense of transporting commo-

dities would be saved, as though the first cost of the railway is *three* times that of the road, the same force will move *ten* times the weight over it. Railways then, it is obvious, afford prodigious facility over any other mode of conveyance, both as regards time and expense; and there is scarcely any limit to the rapidity of movement these iron pathways will enable us to command, or to the improvements in trade, commerce, and even agriculture, which they will allow us to effect.

TEACHING PERSPECTIVE BY MODELS.

MR. TWINING has exhibited to the British Association, Models for Teaching Perspective; and has demonstrated by figures drawn on glass, the importance of having the perspective plane selected in a proper position to the several groups to be embraced in the picture, and the distance of that plane properly proportioned to the breadth of the picture.

RAPID PRINTING.

A MR. MORETON, of the United States, is stated to have bequeathed a premium of £40,000 for the first machine that shall print 10,000 copies of a newspaper within an hour.—(*Times*, April 4.) To this Mr. Applegath has replied:—"In the construction of a machine to print more than 10,000 copies an hour, I propose to content myself with taking as a *datum* the *maximum* speed of the old flat machines, viz., 1,500 strokes, or 264,000 inches, per hour. This may be fairly laid down not as a *maximum*, but as a safe and practical driving speed. A machine similar to that at the *Times* office, with a (roto-vertical) type cylinder of 160 inches, and 10 printing cylinders arranged round it, driven at the above rate, would strike off 16,500 impressions in an hour. Now, the form of type and the inking table are about 80 inches in length, so that another form of the same size may be attached to the type cylinder, and with an upper story of laying-on tables added (as in use on the old machines), and a very little alteration to make each feeding apparatus do double duty, twice as many impressions may be made at the same time; that is, 16,500 sheets printed on *both* sides on one machine."

IRON RAILWAY STRUCTURES.

IN the year 1847, a Government Commission was appointed for the purpose of inquiring into the conditions to be observed by engineers, in the application of iron, in structures exposed to violent concussions and vibration; and for endeavouring to ascertain such principles and forms, and to establish such rules, as should enable the engineer and the mechanic, in their respective spheres, to apply the metal with confidence, and should illustrate, by theory and experiment, the action which would take place, under varying circumstances, in the iron railway bridges which had been erected. Numerous witnesses of great theoretical attainment and practical experience have been examined before the Commission; and a very interesting series of *experiments has been* carried on, for ascertaining certain points relative

the compression and extension, the tensile and crushing strength, the effect of statical pressure, and of vibration, concussion, &c. The result of this laborious investigation is, that, "considering that the attention of engineers has been sufficiently awakened to the necessity of providing a superabundant strength in railway structures, and also considering the great importance of leaving the genius of scientific men unfettered for the development of a subject as yet so novel and so rapidly progressive as the construction of railways, we are of opinion that any legislative enactments with respect to the forms and proportions of the iron structures employed therein would be highly inexpedient."

Mr. William Cubitt, in his inaugural address, as President of the Institution of Civil Engineers, has thus referred to the Iron Tubular Bridges across the Conway and Menai Straits:—"In tracing the original idea of the most advantageous disposition of a certain amount of material, in a tubular form; the more definite conception of a hollow beam, to permit the passage and support the weight of an engine and train; the experiments for determining the proper distribution of the material, to prevent compression, or disruption; the arrangements for the construction and building up these gigantic masses of material; the means of floating them to their situations, and of raising them to their ultimate destinations, at an elevation of 102 feet above the sea (at high water of spring tides);—we must feel justly proud of possessing among us the man whose comprehensive mind could originate this magnificent design, and so successfully perform a portion of the work as to leave no doubt of its ultimate accomplishment. The world already duly appreciates this great undertaking, and we should not be behind hand in testifying our estimate of the bold conception of Mr. Robert Stephenson in the original idea, his professional skill in the design and execution, his care and caution in availing himself of the talents and experience of Mr. W. Fairbairn and Mr. Eaton Hodgkinson, whose scientific investigations respecting the strength of cast-iron are so well known to the world, and so highly appreciated by our profession, and his entrusting the general construction and elevation to Mr. Frank Forster and Mr. Edwin Clarke. Upon the merits of all these gentlemen we may look with pardonable pride and partiality; their labours speak for themselves. However advantageous may be the results of this construction in facilitating an important communication, it has already been extremely useful in directing attention to the more general use of wrought iron for purposes to which it had not previously been deemed applicable; and it will be found that its introduction to structures of all kinds will become more common exactly as the method of using it becomes better understood."

The Report of the Commission has been published.

IRON LIGHTHOUSE ON THE BISHOP'S ROCK.

THIS structure has been erected by Messrs. Walker and Burges, on the *Bishop's Rock, situated* about thirty miles from the Land's *End, Cornwall, and four miles* due west from the St. Agnes Light-

house. The position is more exposed to the force of the Atla the famed Eddystone Lighthouse, and the surface of the ro such an outline as scarcely to admit of a solid building. therefore determined to erect such a structure as should offer no opposition to the waves, and bear a light at such an ele to render it extensively useful. Six hollow cast-iron column strong bar of wrought iron in each, sunk to the depth of five the rock, forming at the base a hexagon 30 feet in diame tapering upwards, support, at a height of about 100 feet, the of the three light-keepers, with stores and provisions for four the whole being surmounted by the lantern. The access to th ing is by a centre column of cast-iron, containing a spiral s The difficulties overcome in the execution of this bold de scarcely be appreciated without a more detailed account of *dress of Mr. W. Cubitt, President of the Institution Engineers.*

STEAM RAILWAY BRIDGE AND PONTOONS.

Among the builders of steam-vessels, Mr. Scott Russell particularly mentioned, for the successful investigation and ap of the wave lines to the forms of vessels, so that the curves disturbance can at once be adapted to a vessel, the ulti greatest velocity of which has been previously determined; high speeds, and easy motion through the water, can be s whilst a given immersion is arrived at with certainty. These poi been remarkably shown in the *Manchester*, a vessel for carry sengers across the Humber, at New Holland; and with its steamer the *Sheffield*, constructed by Messrs. Rennie, becomi were, floating bridges, completing the line of the Manchester, S and Lincolnshire Railway, and conveying the contents of th from point to point, at a speed of about sixteen miles an ho connexion with this railway must be mentioned the large p recently built by Messrs. E. B. Wilson and Co., of Leeds, fr design, and under the direction of, Mr. John Fowler. This i iron-vessel, which is 400 feet long, 50 feet wide, and 8 feet de a deck area of 20,000 square feet, serves as a floating landing s these fast passage-steamers, rendering the railway trains inde of the tide, and of the muddy shores of the Humber. The de of this landing stage is about half that of a somewhat similar s built a short time previously from the designs of Mr. W. Cub under his direction, at Liverpool.—*Address of the President Institution of Civil Engineer.**

* Mr. Cubitt has stated that, "towards the completion of the System, much has been accomplished within the last twelve months, that public excitement which accompanied all its former progress are now nearly 5500 miles of railway completed in Great Britain, at about £220,000,000 sterling, which immense sum, derived from sources, has been expended within the realm, encouraging in an e nary degree productive industry of all kinds, and inducing a revo all mercantile transactions and social relations."

DRAINAGE OF TIDAL TOWNS.

The following interesting letter has been addressed to the *Times*:—

"An original suggestion for the Drainage of London has just been made by Mr. Goldsworthy Gurney, proposing to take advantage of the tide's running down 7 miles, and up only 5. The paper containing this suggestion has been put into my hands to examine the correctness of certain data and calculations necessarily connected with its practical application. I have maturely considered the subject, and have been forcibly struck with its originality. * * He says:—'The current of the Thames, in round numbers, at London Bridge runs down 7 hours and up only 5 every tide; in winter more, in summer less, depending on the amount of river water; it runs at a rate of about from 5 to 7 miles per hour (no matter what the speed—let us suppose it to run at the same rate up and down for our present purpose). It is plain that anything thrown into, and forming part of, the Thames at high water would, in 7 hours, be carried more than 40 miles down the river—never to return. In order to make this more clear, let us suppose a portion of sewage (or, what is better, a sea log) to be thrown into the river precisely at high water at London Bridge; in 7 hours, taking 6 miles per hour as the mean rate of current, it would be carried 42 miles down the river. On the return of the tide in 5 hours, the full time of flow, it will only have come up 30 miles, and, at the time of high water, would be 12 miles below the bridge. The next ebb would carry it 42 miles further down the river, or 54 miles below London Bridge; at the return of next high water, it would be left 24 miles down the river, thus descending 24 miles in 24 hours, until it went clear into the sea. If our numbers are correct—and they are not far from the truth—it is self-evident that if the sewage of London were collected, and allowed to run in the Thames at high water, like the sea log above stated, it would, at low water, be 42 miles down the river; it would never return to pollute the river, for 5 hours' flow would only bring it 12 miles below the place whence it started.' * * The practice seems true; the principle self-evidently correct. At the end of the paper appears the following anecdote, which so clearly shows the principle, and is so naturally put, that I cannot help giving it as it originally stands:—'When I was a boy, I was much amused to observe a dead pig flow up and down a tidal river every day; as regularly as the day came my friend the pig came also: he grew bigger and bigger, and shortened his visits about a mile every tide, until at last he went to sea, and, poor fellow! I never saw him more. He made me a philosopher. What could make a dead pig grow? or why did he choose to shorten his visits so regularly a mile a tide?' It is clear, following out this anecdote in illustration of our subject, if a 'dead pig' were thrown over Waterloo Bridge at low water, he would go up with the tide for 5 hours, and be 5 hours more in returning to the same spot; he would now only have two hours' ebb before he met the flood coming up; he would, of course, return with it, go again up the river, and might be seen for a week: but if he were thrown over at high water, he would float down for 7 hours, he would come up only 5, and consequently would never be seen again within 12 miles of Waterloo Bridge.

"King's College." "James Hann.

STRENGTH AND ELASTICITY OF STONE AND TIMBER.

Professor Hodgkinson has communicated to the British Association, the Report of a series of careful experiments on the Power of Stone, Timber, and Iron, to resist pressure and tension. The results arrived at with respect to iron are—that it is not elastic; that if once it becomes deflected, it does not regain its original position. For all practical purposes, this fact is perhaps of inconsiderable interest; but philosophically, none of the substances named are elastic.

A discussion ensued, in which Mr. Webster, the President of the *Mechanical Section*, remarked, that he conceived the fact to

be, that the particles of cast iron, in a mass of metal, wh pressure was applied, lost their equilibrium by their friction up themselves. When the pressure was removed, they never regain their equilibrium, as the shape and relation of the granulated partic composing the metal were changed. There was this consolatio however, for railway engineers, and others making iron bridges: th if a girder or bridge composed of cast metal be deflected by a gre pressure, no succeeding pressure, if it is less, ever increases th deflection.

MALLEABLE IRON FIRE-PROOF FLOORING.

A PAPER has been read to the Institute of British Architects, l Mr. C. Barry, jun. descriptive of a Mode of Constructing Malleal Iron Fire-proof Flooring, recently patented by Mr. Beardmo Mr. Barry described the experiments made by Mr. Beardmore, t result of which was the form of construction patented by him. Tl consists of a mere beam of sheet-iron of a reversed T form, having t and bottom flanges; the latter being connected with plates of t same material, on which is laid concrete, or other noncompressil material, which keeps the beams in their vertical position, and there brings into action their full power to resist compression. The adva tages of the materials employed are their perfect fire-proof charact their non-liability to disintegration on exposure to fierce flame, a the fact of their cohesion not being destroyed by sudden coolin while the mode of construction is less expensive than the usual co bination of brick arches and cast-iron girders, and occupies much l space between the ceiling and the floor line.

COST OF A BOUNDARY LINE.

THE Boundary Line between the United States and Canada run accordance with the Ashburton Treaty, cost the labour of 300 m 18 months. For 300 miles, a path was cut through the forest 30 f wide, and cleared of all trees. At the end of every mile is a cast-ir pillar, painted white, square, 4 feet out of the ground, 7 inches squ at the bottom, and 4 inches at the top, with raised letters on its sid naming the Commissioners who run the line, and the date.—*Montr Morning Courier.*

CAOUTCHOUC MANUFACTURE.

MR. NICKELS, Albany Road, Surrey, has patented Improveme in Preparing and Manufacturing India-rubber (caoutchouc): referri to the construction of the masticating machine, and to the vulcani tion of caoutchouc.

The masticating machine consists of a case open at top, but capal of being closed at pleasure, in which revolves the kneading roll fitted with flanges at each end, to prevent the caoutchouc un operation from coming into contact with the ends of the cylinde and the roller is in some cases made to work eccentrically in t cylinder. Heat is communicated by means of a steam jacket.

The powder or flowers of sulphur is mixed with the caoutchc while in the masticating machine, and heated to a low temperature

rtion of one to six; after which it is pressed into blocks in noulds, and may then be cut into sheets or thread. The e, however, first put under a weighted board, to which a o movement is imparted, in order that the vulcanized caout-y be subjected to pressure and to a vibratory motion, which, tee states, produces a beneficial effect upon it. Fumes of may be substituted for the powder or flowers, and it is pro- pass hydrogen or phosphorus to the caoutchouc during the ng process.

INDIA-RUBBER RIGGING SPRINGS.

NEWALL, wire-rope manufacturer, has patented an elastic for Rigging. It consists of a long box of iron plates at each e ship, containing square blocks of India-rubber, divided by es of sheet-iron. By a regulating screw, the rigging can be to any degree of tightness; and whatever strain is afterwards by winds, lurching of the vessel, or other cause, the spring, ction, pulls the rope back to its place when the strain is

NEW PROPERTY OF GUTTA PERCHA.

onders of Gutta Percha are by no means at an end. Its purposes appear to be themselves outvied by its singular s. Several new ones have been recently discovered. Mr. of Edinburgh, has communicated to the Royal Scottish f Arts, a notice of one peculiar property. When cast and o sheets, it assumes the nature of a fibrous substance—it tenacity in a determinate direction. When in the roll or s tenacity is longitudinal; but if a strip be cut from the two peculiarities occur: the strip is susceptible of a definite n to nearly five times the original length, and its direction of is reversed. When it is considered that gutta percha is a fluid substance, or gum, these peculiarities are indeed nd remarkable. In fact, when we keep its multiform uses other properties in view, together with such a peculiarity, it all the importance, or at least the simulative form, of a sort of iron; an idea, however, fanciful as it may be, which another tory property, also newly discovered, only tends to upset; said to be, like glass, an electric,* only it far excels glass uch.—*Builder*, No. 324.

STRENGTH OF GUTTA PERCHA TUBING.

IES of experiments have been made at the Birmingham rks, relative to the strength of Gutta Percha Tubing, with a its applicability for the conveyance of water. The experi-re made (under the direction of Mr. Henry Roffe, engineer), es three-quarters of an inch diameter, and one-eighth of

* See the "Electrical" Section of the present volume.

gutta percha. These were attached to the iron main, and subjected for two months to a pressure of 200 feet head of water, without being in the slightest degree deteriorated. In order to ascertain, if possible, the maximum strength of the tubes, they were connected with the Water Company's hydraulic proving pump, the regular load of which is 250 lbs. on the square inch. At this point the tubes were unaffected, and the pump was worked up to 337 lbs.; but, to the astonishment of every one, the tubes still remained perfect. It was then proposed to work the pump up to 500 lbs., but it was found that the lever of the valve would bear no more weight. The utmost power of the hydraulic pump could not burst the tubes.

The gutta percha being somewhat elastic, allowed the tubes to become slightly expanded by the extraordinary pressure which was applied; but, on its withdrawal, they resumed their former size.

This tubing is such an extraordinary conductor of sound, that its value, not only to deaf persons, but to the public generally, will speedily be appreciated. It has already been fitted up in dwelling-houses, in lieu of bells: as speaking-tubes for giving and receiving messages in mines, railway stations, prisons, workhouses, hotels, and all large establishments, it is invaluable.

EXTRAORDINARY DESPATCH.

A coil of copper wire, 12,200 feet long, was delivered at the Gutta Percha Company's Works, City Road, at 4 P.M., to be covered with sulphuretted gutta percha for the Prussian Government, with strict injunction that it must be despatched by the Hamburgh mail on the following day. Notwithstanding this short notice, the extraordinary feat was accomplished, the coil being shipped within twenty-four hours of its arrival at the Works.

USE OF GUTTA PERCHA IN HOUSE REPAIRS.

A correspondent of the *Builder*, No. 357, suggests the use of Gutta Percha for the repairs so often requisite of modern built dwelling-houses of the small class; in which the greatest evil results, perhaps, from the timber employed in the joiner's work not being sufficiently seasoned. Hitherto the remedy to make good the defects occasioned by the shrinking, &c., as in the floor-boards, has been to let in between the joints slips of wood, putty, &c.; but this cannot be depended upon, as in case of further shrinking it drops through; neither is it waterproof. It is proposed that gutta percha be used. Thus:—warm the gutta percha till it becomes glutinous; then with a heated iron or chisel point all along the joint, and it will be found that the adhesiveness of gutta percha is such, after two or three minutes, that the whole surface becomes as one board, the great merit being that there is no occasion to use any solution or cement to make the gutta percha unite to the woodwork, as is the case when applied to leather and other purposes; but there exists such an affinity between the two that, for example, supposing a hole six inches square were cut in the

flooring, with nothing underneath for support, and to make good the same a new piece were let in, well set all round in gutta percha, it will so unite with the boards as to enable that portion to bear as great a weight as any other part. What has been said of making good the space between the floor-boards will equally apply to all joiner's work, as in the panels of doors, a shake in which has hitherto been without any effectual remedy. Also to the skirting running round the rooms, which is often to be found leaving the floor-boards, &c. &c.

The great feature gained is, that gutta percha not only fills up the space, but at the same time hardens and unites the whole.

GUTTA PERCHA FOR DOMESTIC PURPOSES.

The Gutta Percha Company have published the following list of Domestic Purposes for which the new material is used:—

"Soles for boots and shoes, lining for cisterns, &c., picture-frames, looking-glass frames, ornamental mouldings, bowls, drinking-cups, jars, soap-dishes, ornamental inkstands, vases, noiseless curtain-rings; card, fruit, pin and pen trays; tooth-brush trays, shaving-brush trays, window-blind cord, clothes-line, imitation fringe, coloured material for amateur modelling, ornamental flower-stand and pots, sheeting for damp walls and floors, conveyance of water, gas, &c., drain and soil pipes, tubing in lieu of bells, tubing for watering gardens, washing windows, &c.; lining for bonnets, &c.; jar covers, sponge-bags, watch-stands, shells, foot-baths, lighter stands. Manufacturing: Mill bands, pump buckets, valves, clacks, &c.; felt edging for paper-makers, bosses for woollen manufacturers, flax holders, shuttle-beds for looms, washers, bowls for goldsmiths, bobbins, covers for rollers, round bands and cord, breasts for water-wheels. Surgical: Splints, thin sheets for bandages, stethoscopes, ear-trumpets, balsam for cuts, bed-straps, thread, bed-pans for invalids. Electrical, &c.: Covering for electric telegraph wire, insulating stools, battery cells, handles for discharging-rods, &c.; electrotype moulds. Chemical: Carboys, vessels for acids, &c., syphons, tubing for conveying oils, alkalies, &c., flasks, bottles, lining for tanks, funnels. Uses on ship-board, &c.: Sou'wester hats, life-buoys (which are more buoyant than cork), buckets, pump-buckets, hand speaking-trumpets. drinking-cups, powder-flasks, fishing-net floats, sheathing for ships, waterproof canvas, air-tight life-boat cells, tubes for pumping water from the hold to the deck, round and twisted cords (these cords do not sink in water like the hempen ones), lining for boxes, speaking-tubes for communicating between the man on the look-out and the helmsman. Ornamental applications: Medallions, brackets, cornices, console tables, an endless variety of moulding in imitation of carved oak, rosewood, &c.; for the decoration of rooms, cabinet-work, &c., picture-frames. Agricultural purposes: Tubing for conveying liquid manure, lining for manure-tanks, driving bands for thrashing machines, &c., traces, whips. For offices, &c.: Inkstands, ink cups (in lieu of glass), pen trays, cash-bowls, washing basins, &c. (which cannot be broken), tubes for conveying messages, canvas for covering books, &c., architects' and surveyors' plan cases. Miscellaneous: Suction-pipes for fire engines, fire and stable buckets, lining for coffins, sounding boards for pulpits, tap ferules, communion trays, tubing for ventilation, hearing apparatus in churches and chapels for deaf persons, cricket-balls, bouncing balls, portmanteaus, police staves, life-preservers, embossed book backs, embossed globes and maps for the blind, railway conversation tubes, miners' caps, beds for paper-cutting machine knives, skate bottoms, &c."

GUTTA PERCHA FOR ARTIFICIAL TEETH AND GUMS.

Mr. Truman, of the Haymarket, dentist, has patented an Improved Method or Methods of constructing and fixing Artificial Teeth and Gums, *and of supplying deficiencies* in the mouth.

The patentee first takes a cast of the mouth in plaster, which he hardens with resin; and then constructs a corresponding metal frame of gold wire, having pegs to which the teeth are attached. The frame is covered with gutta percha, which is drawn round the teeth so as to form sockets for them; and then pressed, while in a warm and plastic state, into the mould, which has been previously wetted. It is then withdrawn, the teeth are lifted off the pegs and out of the sockets, the interior surfaces of which, together with those of gutta percha not intended to come into contact with the gums, are electrotyped. Finally, the teeth are fastened on the pegs and in the sockets by cement. The gutta percha mould will, it is said, fit the gums so accurately as not to require other fastenings; although, if desired, such fastenings may be used.

The second part of this invention consists in electrotyping hard wax, or other soft substance used in supplying the deficiencies in the mouth, in order to prevent their being affected by moisture.

GUTTA PERCHA SEALS.

Most people who have had anything to do with patents are aware that the impression of the Irish Great Seal has been hitherto made in a sort of wax, offensive both to the smell and touch, and of so brittle a nature as scarcely to bear carriage. Instead of this, gutta percha is now used, and with manifest advantage. The gutta percha seal possesses a boldness and sharpness of outline which we have seldom seen equalled even in the choicest medals. We hope to see it soon adopted also for the English and Scottish seals.—*Mechanics' Magazine*, No. 1328.

GLASS MANUFACTURE.

A patent has been granted to Mr. H. Howard, Railway Place, Fenchurch Street, for—1. A peculiar construction of furnace for melting and casting glass, in which the flame is made to encircle and impinge directly against the sides of the pots, effecting thereby uniformity of heat, and an improved quality of material. 3. A portable furnace for melting glass, with one or more working holes. 3. The adaptation of a sheet of platina to the crown of melting and refining furnaces. to prevent the droppings falling into the pots. 4. A peculiar form and construction of annealing surface with flues in the centre near the bottom, and holes in the top for allowing the heat to escape, and admitting light when emptying it of its contents.

MANUFACTURING GLASS BY MACHINERY.

Mr. J. G. Wilson, of Chelsea, engineer, has patented certain improvements in the Manufacture of Glass, and in Machinery and Apparatus connected therewith.

1. The melting furnace is proposed to be constructed with a ring resting on anti-friction rollers, which is made to revolve as occasion may require by means of toothed gearing. Motion is communicated

from the outside by a winch-handle. The pots, which are constructed with corrugated or angular surfaces to retain the heat, are placed on the ring, which is fluted at top to allow free passage to the heat. The top of the dome is constructed with a deflecting surface, in the shape of two parabolas joined together at the sides, whereby the heat which escapes from the side of the pots is reverberated on to the surface of the metal. The door or mouth of the furnace is closed by a mouth-piece, having two recesses on the opposite sides, and supported on a spindle, whereby it is made to revolve by any ordinary means. When it is desired to introduce a pot into the furnace, it is placed in the exterior recess of the mouth-piece, which is made to rotate until it is brought inside. The pot is then pushed, by means of tools passing through holes in the mouth-piece, on to the ring, which, by its revolution, carries the pot further into the furnace. The arrangements for withdrawing the pots are necessarily the converse of the preceding.

2. The furnace is to be fed from a hopper through an inclined shoot, in which an Archimedean screw works.

3. The casting table is constructed of cored bars of iron, which are bolted together and heated by the introduction of steam, previous to the metal being poured in for the purpose of preventing the too sudden expansion of the table. It is proposed to place a similarly cored slab of iron, constructed in sections, above the casting table, and resting on ledges on the interior of the sides thereof. Some suitable elastic material is laid on the joints, which, as the air is exhausted from the space between the two tables, is forced in by atmospheric pressure, and closes them hermetically. The mouth of the top table is closed by one half of a cylinder, which fits into it exactly—the other half being cut away, so as to allow the metal to flow in when brought into position by partial revolution. The table is also provided with a species of safety-valve apparatus for allowing the vapour from the metal to escape.

4. The grinding and polishing table is perforated, and communicates with an exhausting apparatus. Strips of gutta percha or vulcanized India-rubber are arranged upon its top surface, on which the plate of glass is laid. The air is then exhausted from the under side, and the plate secured by atmospheric pressure, without being liable to fracture during the grinding and polishing process. Or, the top of the table is to be covered with some suitable material, such as gutta percha, which is rendered plastic by the application of heat, and on which the plate is laid, and imbedded by its cooling. When the plate is finished, and to be removed, the gutta percha is rendered plastic, as before.

5. Instead of using a "ponty rod" in the manufacture of glass, as hitherto, it is now proposed to employ a rod with elastic arms, to embrace the globe and expand with it when the "flashing" takes place.

EFFECT OF OXYGEN ON COLOUR OF GLASS.

MR. F. PELLATT has read to the Society of Arts, a paper on the supposed influence of Oxygen on the Colour or Tint of Flint Glass.

The author, in commencing, states that the remarks contained this paper are entirely the result of experience in the manufacture glass in large quantities; it being only under such circumstances t many of the changes there noticed can be observed, because they so minute that, in dealing with small quantities, their occurre would not be perceptible. In speaking of white glass, the term comparative, as no glass is perfectly colourless; and to the practi eye of the glass-maker there exist no pieces of the same tint or sha the word colour, therefore, is used to denote that particular tint shade, whatever it be, which all white transparent glass posses With these remarks the author proceeded to consider the actior oxygen as affecting the colour of flint glass in two distinct particul First, its action upon the glass mixture during its melting or found whilst in a state of fusion; and secondly, during its annealing or g dual cooling.

The constituents of flint glass are silica, lead, carbonate of pota and nitrate of potash. The silica is found sufficiently pure as t sand, which abounds in some districts,—that from Allum Bay, Isl Wight, is much esteemed. The protoxide of lead—litharge, or deutoxide—red lead, is the state in which the lead is used; and potash is the ordinary curl and nitrate of potash of comme These, when mixed in certain proportions, and subjected to a str heat for sixty or seventy hours, produce flint glass. The purer metal the more transparent the glass; but although all the mater be chemically pure, a colourless glass is not the product: owing some chemical change which takes place during the melting, the g is tinted with green. This is generally stated to arise from the prese of oxide of iron; but the author believes that in most instances i owing to the want of a necessary proportion of oxygen in the mixt which the following experience will go far to prove:—The tint of gr is always minus when the lead in the glass mixture is in the higl state of oxygenation—that is, when red lead is used—and lowest w litharge is employed in the mixture. When an excess of carbonat potash is used, the green tint is deep; but it may be entirely overco by the use of nitrate of potash, and superseded by a purple tint w no metal but lead is present.

Oxygen being the agent by which these changes in the colour the glass are effected, the glass-maker, in order to overcome the gr tint always present when oxygen is minus, uses the oxide of man nese, which has the property of giving off its oxygen very slowly. excess of manganese gives to glass a purple tint, and where altoget absent, the glass is always green.

Having thus called attention to the peculiar composition and m of manufacturing flint-glass, Mr. Pellatt next described the chan which take place in the colour or tint of glass, and the methods e ployed by the glass manufacturer to convert the mass from a gre purple, amber, or other tint, to a pure or colourless metal; and brou forward examples tending to prove that the changes in the colour *the glass are due to* the presence or absence of a given proportion

oxygen. Manganese, as a metal, gives no colour to glass; although by the oxygen it yields to the lead in the mixture, a purple colour is produced, because by reducing the quantity of oxygen, either by polling or subjecting the glass to a long-continued heat, or by submitting it to the action of carbon, the purple colour is removed, though the manganese still remains. Iron and copper also assume different colours when combined with different proportions of oxygen. If this be true, may not all colours of the oxygen of other metals, such as iron, copper, and lead, be due to the combination of certain proportions of oxygen with the metal or metals present, so as to induce a particular molecular arrangement, from which the glass has the power of absorbing a particular colour ?—*Builder*, No. 323.

USE OF COLOURED GLASSES TO ASSIST THE VIEW IN FOGS.

The following curious observation is made by M. Luvini, of Turin, in a letter to the editor of *L'Institut*, at Paris. If it be verified, it may prove to be of importance to geodetical operations, as well as in observations at sea :—" When there is a fog between two corresponding stations, so that the one station can with difficulty be seen from the other, if the observer passes a coloured glass between his eye and the eye-piece of his telescope, the effect of the fog is very sensibly diminished, so that frequently the signals from the other station can be very plainly perceived, when, without the coloured glass, the station itself could not be seen. The different colours do not all produce this effect in the same degree. The red seems the most proper for the experiment. Those who have good sight prefer the dark red ; those who are short-sighted like light red better. The explanation of this effect seems to depend upon the fact that the white colour of the fog strikes too powerfully upon the organ of sight, especially if the glass have a somewhat large field. On the contrary, by placing a coloured glass between the eye of the observer and the eye-glass of the instrument, the intensity of the light is much diminished by the interception of a part of the rays ; the observer's eye is less wearied, suffers less, and consequently distinguishes better the outlines of the object observed."

OPTICAL FLINT GLASS.

The following recipes by Mr. Cooper, glass manufacturer, Aberdeen, for making good Optical Flint Glass, have been communicated to the Scottish Society of Arts :—

	lbs.
Sand, well washed, dried, and sifted	60
Oxide of lead	60
Purified carbonate of potash	15
Saltpetre	3·5
Cullet	15 to 20

The specific gravity of the glass is 3·568, and of ordinary density. A heavier glass is obtained by altering the proportions thus—

	lbs.
Sand	60
Oxide of lead	63
Purified carbonate of potash	14
Saltpetre	3·25
Cullett	20

The specific gravity of this glass is 3·628. In both cases, the cullet must be of the same kind of glass.

SOLUBLE GLASS.

What is called Soluble Glass is now beginning to come into use as a covering for wood and other practical purposes. Some of our clever artisans may like to experiment upon it. It is composed of fifteen parts of powdered quartz, ten of potash, and one of charcoal. These are melted together, worked in cold water, and then boiled with five parts of water, in which it entirely dissolves. It is then applied to woodwork, or any other required substance. As it cools, it gelatinizes, and dries up into a transparent colourless glass, on any surface to which it has been applied. It renders wood nearly incombustible.—*New York True Sun.*

SILVERING GLASS BY AID OF GUN-COTTON.

M. Vohl has discovered that a solution of Gun-Cotton, in a caustic ley, possesses, in a high degree, the property of precipitating silver from its solutions in the metallic form. On pouring into it a few drops of a solution of nitrate of silver, and adding ammonia until the oxide of silver formed is re-dissolved (the mixture being slowly heated in a water bath), the liquor will, at a certain period, assume a deep brown colour, and effervesce, the whole of the silver being precipitated on the sides of the vessel. The mirror thus produced is much superior in brilliancy to those produced by means of etherial oils or ammonial aldehyde; and the facility with which it is produced will doubtless render it of practical importance.—*Technologiste.*

ENAMELS FOR IRON.

Mr. Charles Stumer, of New York, has secured a patent, which he describes to consist "in providing an enamel for iron and other metals, which will retain its adhesion to the metal, and particularly is not capable of being crumbled or broken off by blows or by heat; this possessing the quality of comparatively commingling with the surface of the metal. Thus it is far superior to any known enamelling for metals, and may be modified so as to render it in all the shades of colours, in full variety. 1.—16 ounces of gravel sand, 10 ounces of silver glass (silver gilt or silver gilding), 2 ounces of white clay, ¾ of an ounce of saltpetre. 2.—7 ounces of glass (common white glass), 4 ounces of gravel sand, 8 ounces of zean reanocks (or oxide of tin), 6 ounces of borax, 1½ ounce of soda, 3 ounces of *saltpetre, 1¼ ounce of* white clay, 1 ounce of magnesia, ¼ of an ounce

of white chalk, ⅛ of an ounce of oyster shells; this should be pulverized like first composition, and then mix with the gum water. The novelty claimed is the enamel composition.—*Franklin Journal.*

SOCIETY OF ARTS.

On Thursday, June 14, the Annual Distribution of Prizes took place, H. R. H. Prince Albert, the president, in the chair. In his speech, the prince stated that he had been induced this year to offer two medals on his own account, to be competed for on two subjects, very different in themselves, but appearing to ask for competition, and to be particularly eligible as subjects to which public attention should be drawn. The first was for making a good cement to bind glass together. The substitution of glass for metals was a matter of great importance as regarded cleanliness, and consequently the promotion of the public health, and that had been prevented to a great extent by the want of a cement that would hold. All connected with the manufacture of glass well knew that slipperiness of surface was a great cause of the difficulty experienced. The subject of the next medal was one of national importance, and was intended to promote an improved system in the production of sugar. His Royal Highness then entered more fully into this question, and very appropriately expressed his satisfaction to see in the Colonial Secretary's presence a proof of the importance attached by the Government to this subject. The latter medal was awarded to Dr. Mitchell, but the former was not conferred on any one. The Report read by the secretary stated that the revenue had increased during the past year from £800 to £1,600 per annum; and that the Society had applied to the Board of Trade and the Woods and Forests for a space of ground for exhibitions of manufactures, the first of which it was proposed to hold in 1851. The prizes were then distributed, and the meeting was addressed by the Bishop of Norwich (Dr. Stanley), Chevalier Bunsen, Sir E. Codrington, and others, and a vote of thanks accorded to the president.—*Builder*, No. 333.

METAL WORK.

A paper has been read to the Society of Arts, by Mr. D. Wyatt, "On Metal Work and its Artistic Design." He commenced with some remarks on the absolute necessity of the study of *specific* design, in order to confine the errant imaginations of artists within reasonable bounds,—and in order fully to take advantage of all the natural properties, mechanical capabilities, and recorded experiences peculiarly belonging to all materials, in the elaboration of which it is requisite that an alliance between use and beauty may be effected. The author maintained that all propriety and perfection in manufacturing design were derivable from the result of such studies; and that the more clearly the objective individuality of every ingredient was preserved and enunciated in the finished article, the more satisfactory to both eye and mind would the character of its ornamentation appear. The *specific design of metal work was* described as based on three great

studies,—a thorough knowledge of which was requisite to all who would either manufacture, compose, or criticize in any one of its various ramifications.

The first of these was that of the distinctive characteristics and appliances of each metal. The second, its form as modified by all the mechanical processes of manufacture. The third, a thorough analytical and critical acquaintance with all the best models in which reasonable and good principles of Art can be traced, and through modifications of which pleasing associations of idea may be commanded at the will of the designer. In accordance with his scheme thus laid down, the author proceeded to deduce the correct theory of the manufacture of each metal from the properties with which it had been endowed by Nature. He then described the process by which almost all objects in metal must be produced; dwelling on those best harmonizing with the character of each substance and the accredited conventionality of its use. Thus, he emphasized the refining, beating into sheets, wire drawing, stamping and torsion of gold; the beating in a plate, gilding, dead silvering, parcel gilding, soldering, &c., of silver; the hollow casting of bronze by means of wax and of moulds, and the solid founding of iron in complex forms. Having disposed of the *structural* processes, the author analysed the decorative or superficial; enumerating and sketching out the leading peculiarities of engraving—matting, niello, cooking, burnishing; the six chief divisions of enamel; and three or four varieties of damascening.

The mechanical limits of the art being thus pointed out, the impressions suggested by the history of past chefs-d'œuvre were cursorily examined. The extreme antiquity of metal-work, and its details among the Jews, Egyptians, Assyrians, Persians, Greeks, Etrurians, and Romans, were demonstrated from descriptions furnished by various authors and by monuments of wonderful merit still existing. The speaker passed quickly over the mediæval portion of the subject; and concluded by calling attention to the beautiful examples by which he was surrounded, and urging a systematic recognition of first principles and practical details to be superadded to the study of Beauty and Fine Art in the abstract.

INTERIOR OF THE LONDON NEW COAL EXCHANGE.

THE interior of the new London Coal Exchange, lately completed, at the corner of Lower Thames-street and St. Mary-at-Hill, under the direction of Mr. Bunning, architect to the Corporation, presents considerable novelty both in design and decoration. It includes a circular area for the meeting of the merchants, 60 feet in diameter, with three galleries running round it, which communicate with suitable offices; and the area is covered by a glazed dome, the eye of which is 74 feet from the floor. The galleries are peculiarly constructed, and entirely composed of iron, embellished with symbols of the coal trade. The stauncheons, brackets, ribs and eye of the dome, are also of iron; and the panels (twenty-four in number) are ornamented with paintings of the plants and fossil remains found in the coal series, from drawings

made by Mr. Melhado, a pupil of the architect, from specimens in the British Museum, and painted by Mr. Sang in encaustic. The eight smaller compartments are filled in with implements used in the coal districts. The panels in the galleries contain figures of the miners, which are less satisfactory in execution. Each rib, of which there are thirty-two, is 42 feet 6 inches long, and is cast in one length, averaging in weight 2 tons: there are in all about 300 tons of iron, including the gully plates, stauncheons, brackets, &c. The galleries are about 12 feet from floor to floor. The cupola is glazed with ground plate glass, and the eye with amber-coloured glass. The ornamental portions of the stauncheons, gallery railing, soffits, &c., display in almost too great profusion the rope form. The tessellated floor of the Grand Hall (60 feet in diameter), consists of upwards of 4000 distinct pieces of wood, of various kinds and qualities, which are arranged in the form of the mariner's compass; having the City shield, anchor, and other ornamental designs in the centre. The whole of these pieces were, only a few months previously, either in the tree in the growing state, or cut from wet logs, and were prepared for use in the course of a few days, by the new method of seasoning, known as the Patent Desiccating Process of Messrs. Davison and Symington. The woods employed are black ebony, black oak, common and red English oak, wainscot, white holly, mahogany, American elm, red and white walnut (French and English), and mulberry. The black oak is part of an old tree which was discovered, and removed from the bed of the Tyne about the latter end of 1848. This tree is supposed to have grown on the spot where it was found, and, owing to its large dimensions, must have been at least 400 or 500 years old at the time it fell; but how many centuries it had been covered with water it would be impossible to say. A considerable portion of this tree was forwarded to London, by the Mayor and Corporation of Newcastle. Of course, it was completely saturated with moisture on its arrival; but it now forms a beautiful contrast to the other woods, owing to its exceedingly dark colour. The red and white (or sap and heart) walnut, on the other hand, was growing in the very ancient park belonging to C. T. Towers, Esq., Weald Hall, Essex, in December, 1848; this tree now forms the circular fret—the red and white being alternately interspersed, has an excellent effect. The mulberry wood, introduced as the blade of the dagger in the City shield, is no less than a piece of a tree which was planted by Peter the Great, when working in this country as a shipwright. Not one piece out of the 4000 occupied more than ten or twelve days in seasoning; a conclusive proof that it is no longer necessary to keep wood for years to season, as has hitherto been the case. Besides the ornamental floor, and the floor to which it is secured, the whole of the timbers, joists, and woodwork of every description throughout the building have been desiccated by the patent process, the adoption of which by the architect, Mr. Bunning, does great credit to his judgment and discernment. A staircase leads to the Roman hypocaust which was discovered in excavating for the foundation. A visit to

this will amply repay the lovers of antiquity; and its minute agreement with the details given by Vitruvius should be noticed.

The artificers' works generally have been performed by Mr. Trego; the iron-work by Messrs. Dewer; and the wood-work has been seasoned by Messrs. Davison and Symington's patent desiccating process. The floor of the merchants' area was laid down by the first-named of these gentlemen, Mr. Davison.

The cost of this Exchange will be about £40,000.—*Mechanics' Magazine*, No. 1369.

THE HALL AND STARCASE OF THE BRITISH MUSEUM.

THE Great Entrance Hall, in the British Museum, and the Staircase, are the most effective portions of the new structure.

The order is Grecian Doric. The ceiling is trabeated and deeply coffered, and is enriched with Greek frets and other ornaments in various colours, painted in encaustic. On the east side are the apartments devoted to the MS. department. On the west is the principal staircase, and a gallery which forms the approach to the collection of antiquities. The centre flight is seventeen feet wide, flanked by two pedestals of grey Aberdeen granite, intended to receive colossal sculpture. The walls on either side of this centre flight are cased with red Aberdeen granite, highly polished. On the first landing are pedestals and carved vases of Huddlestone stone. The balustrades are of the same. The ceiling and walls are painted partly in oil and partly in encaustic colours: the former being trabeated and coffered to correspond with the entrance hall, and similarly decorated.

The polychromatic enrichments have been applied with very considerable success. The sunk panels are blue, with a yellow star in each; the enrichments are variously coloured,—red and white predominating; and the stiles, beams, &c., are covered with frets, guilloche, and scrolls, in flat colours, for all of which precedents were found in the Museum collection.—*Builder*, No. 305.

THE CAMDEN RAILWAY STATION.

A DESCRIPTION of the Camden Railway Station of the London and North-Western Railway has been read to the Institution of Civil Engineers by Mr. R. B. Dockray. In the first design of the Railway, in 1833, this station was intended for the sole terminus of the line; and, after much discussion, thirty acres of ground were purchased, although that quantity was considered preposterously large. A short time demonstrated the necessity for the establishment of the Euston Station solely for passengers; and fourteen acres were there secured, and ultimately covered with buildings. The whole station at Camden-Town was then devoted to goods and cattle; and, although in the original design great care was taken to anticipate the wants of the traffic, yet such has been the rapid development of the railway system, that, in the space of ten years, it has proved necessary to sweep away almost every vestige of the original constructions, and entirely to remodel the Station. The results of all these changes were shewn in detail in *M. Dockray's paper*, and the illustrating drawings.

'cular engine-house, 160 feet diameter, to contain twenty-four nd tender, with a central turn-table 41 feet in diameter, and 'oof, was described; as were the other engine-houses, stores, es, sheds, &c., with their appurtenances; and, among the works, the new wrought-iron bridge at Chalk Farm, on Mr. enson's box-girder principle, and the wooden lattice bridge Regent's Canal. The supply of water for the locomotive ras treated of at some length, and exhibited some curious 3. The only water that could originally be used, was taken s at Tring and at Watford; an attempt was, however, made a supply at Camden Station, first from the Regent's Canal, by sinking a well down 145 feet into the chalk, or to a total 300 feet below Trinity high-water mark. The water from stratum was excluded; and although only that from the s pumped up—which ought to have possessed the same as the water at Tring and Watford, derived also from the et it was found to cause the locomotive to "prime," or flush ough the cylinders, with the steam, to such an extent as to impede the progress of the trains. This was shown, by to arise from the excess of carbonate of soda contained in water, of which there was an entire absence in the waters of at Tring and at Watford. The well, therefore, became usele engines; but the water was so excellent for household and rposes, that it has been employed for the general uses of the and for the hotels and houses belonging to the Company. a of the extent of the Station was given by the statement, length of the single line of railway, exclusive of the main 3 12 miles. There were 112 sets of points, 196 turn-plates, cranes varying in power from one ton and a half to twenty ne area of goods' sheds was upwards of 135,000 superficial that of the platforms was 30,000 feet. The annual consumption of gas exceeded 6,000,000 of cubic feet.

BELL-TRAPS.

TRAPS are commonly left loose, because many substances ss through the grating or strainer of the trap refuse to pass either floating so that they cannot go under the lip of the inking in the well so that they do not get over the standing ne drain pipe; and as tea-leaves, rice, and other matters om the washing of plates and dishes, the ravelled threads of ths, hair from brooms, and many other such like matters, way to the grating in the sink, or at the drain head, and f them pass through and lodge in the well into which the bell , the escape becomes choked, and the trap requires to be clear the way. To solder down bell-traps is, therefore, to e sink useless, unless they are protected from access of such ons, or means be devised of clearing them away. They may ted by a wire strainer over the sink to stop everything that *to choke a bell-trap before* it can reach the grating;—or any

ordinary obstruction may be cleared by forcing all such matters as will pass the grating of a bell-trap to go under the lip of the bell, and to rise over the end of the stand-pipe, and so pass away into the drain, and the requisite force may be obtained from a slight head of water by means of a very simple apparatus that may be always at hand in every house:—A tin or other cheap metal tube of three or four feet in length, funnel-shaped at each end, and the edges formed or bound with caoutchouc, so that when stood on end and pressed firmly down there may be a water-tight joint. This instrument placed over the grating of any bell-trap so as to embrace it fully, and filled with water, the pressure will be sufficient to clear away any ordinary obstruction from the trap, and render it unnecessary to leave the trap loose. Such an apparatus may be applied by any maid-servant, and to any sink in or about a house, wherever, it must be added, there is clear height enough for it to be placed upright, though it is capable of being articulated to bend in some slight degree; and it may be made telescope fashion to give the means of increasing the pressure if need be.—*Hosking's "Healthy Homes."*

COST OF IMPURITY.

According to the average of the Returns from 1841 to 1846, we are paying two millions every year for Guano, Bone-dust, and other foreign fertilisers of our soil. In 1845 we employed no fewer than 683 ships to bring home 220,000 tons of animal manure from Ichaboe alone; and yet we are every day emptying into the Thames 115,000 tons of a substance which has been proved to be possessed of even greater fertilising powers. With 200 tons of the sewage that we are wont to regard as refuse, applied to the irrigation of one acre of meadow land, seven crops, we are told, have been produced in the year, each of them worth from six to seven pounds; so that considering the produce to have been doubled by these means, we have an increase of upwards of £20 per acre per annum effected by the application of that refuse to the surface of our fields. This return is at the rate of £10 for every 100 tons of sewage; and, since the total amount of refuse discharged into the Thames from the sewers of the metropolis is, in round numbers, forty millions of tons per annum, it follows that, according to such an estimate, we are positively wasting four millions of money every year—or rather it costs us that amount to poison the waters about us. Or, granting that the fertilising power of the metropolitan refuse is—as it is said to be—as great for arable as for pasture land, then, for every 200 tons of manure that we now cast away, we might have an increase of at least twenty bushels of corn per acre. Consequently, the entire forty million tons of sewage, if applied to fatten the land instead of to poison the water, would, at such a rate of increase, swell our produce to the extent of four million bushels of wheat per annum. Thus, we pour into the river that which, if spread upon our fields, would enable thousands to live—we convert the elements of life and health into the germs of disease and death—changing into slow but certain poison that which in the subtle transmutation of organic nature, would become acres of life-sustaining grain

RAILWAY ACROSS THE ISTHMUS OF PANAMA.

Colonel Hughes, the chief engineer of this great undertaking, has published the following particulars respecting it:—The highest point of the road which is to connect the two oceans will have an elevation of only two hundred and sixty English feet above the level of the Pacific—an elevation which may with little difficulty be reduced to two hundred. This highest point will be reached by a gentle inclination of from thirty to thirty-five feet per mile. Till recently it has been supposed that the line from Sola Nicaragua to Redigo on the Pacific offered the lowest level to be found in the whole space comprehended between Behring's and Magellan's Straits; but this conjecture is now discovered to have been ill founded. According to all probability, it is the plateau of Panama which presents the greatest advantages in this respect. The northern terminus will be established at that part of Simon's Bay which is known as Navy Bay formed by the island of Manzinella; and which, according to the English charts, has an anchorage of thirty feet water at its entrance, and eighteen feet near the land in the direction of Point Coco-Solo. The point for the southern terminus is not yet decided on; but awaits the completion of the minute hydrographic examination about to be instituted. With this exception, the survey of the line may be said to be finished. The engineers left Chagres on the 31st of May for New York; where the plans and estimates of the works were to be offered for contract, and so as to commence the works about January 1850. The length of the railway will be about forty-four English miles. The highest point of elevation is seventy-seven feet lower than that of any other route hitherto surveyed, and a hundred feet below all those spoken of in his reports by M. Garalla, the French engineer.

THE STRENGTH OF, AND ECONOMY IN, RAILWAY AXLES.

The question of the Strength of Railway Axles is, as a security to life and limb, an exceedingly important one in railway transit. The safety of the traveller depends more, perhaps, upon the soundness of the axle than upon any other portion of the rolling stock of a railway. A spring may break, a tube may burst, and a thousand other mishaps occur to the train or the engine, and the passenger experience nothing beyond a short delay, or a temporary uneasiness of motion. The engine and train "keep the metal." But the breaking of an axle is a very different affair; and if the carriage to which the accident happens is a four-wheeled one, the probability is that the train will be thrown off the line. Railway axles, besides, form a very expensive portion of the rolling stock; and, as a matter of safety and economy, the question is one of considerable interest both to the railway proprietor and the railway traveller. An important series of experiments on this subject has been read before the Institution of Mechanical Engineers at Birmingham, by Mr. M'Connell, the locomotive superintendent of the southern division of the London and North Western

Railway. We have not space to quote the details. The following is the conclusion of the paper :—

"The question of deterioration of axles arising from various causes, which I have enumerated, is a very important one to all railway companies; that some change in the nature of the iron does take place is a well-established fact, and the investigation of this is most deserving of careful attention.

"I believe it will be found that the change from the fibrous to the crystalline character is dependent upon a variety of circumstances. I have collected a few specimens of fractured axles from different points, which clearly establish the view I have stated. It is impossible to embrace in the present paper any exposition of the fact on this branch of the subject; but so valuable is the clear understanding of the nature of the deterioration of axles, that I am now registering each axle as it goes from the workshops, and will endeavour to have such returns of their performances and appearances at different periods as will enable me to judge respecting their treatment. When it is considered that on the railways of Great Britain there are about 200,000 axles employed, the advantage of having the best proportions, the best qualities, and the best treatment to such an important and vital element of the rolling stock, must be universally acknowledged."

APPARATUS FOR PREVENTING RAILWAY ACCIDENTS.

THIS Apparatus is the invention of Dr. Sleigh, and may be best described in the words of Mr. Atkinson (agent for the patentee, who has published a short pamphlet on the subject) :—"The first part of the invention consists in the application of oblique pressure to the rails by means of a short lever of the second order, acting on a toggle or hinge-joint, similar to that used in the Stanhope printing-press, by means of which one person can, at will, command, instantly or gradually, a resisting force equal to many tons. Moreover, this is so constructed that the rails cannot be displaced or broken; for according to the principle of the revolution of force, a definite proportion of the force (depending upon the angle of the joint) will act at a right angle on the rails, holding them down; while a bar of iron, only an inch square, called the guard, and which it would take twenty-seven tons to tear asunder, protects them on the outside. Nor can the carriages be lifted off the rails by it; for the fulcrum of the lever will never have on it one-half the weight of the carriage, and that although twenty tons pressure be applied to the rails. It is proposed to attach this apparatus, which cannot cost more than about £10 for each train, to the last carriage; for when a train is suddenly stopped by an impediment in front, it is the last carriage, retaining the momentum it had acquired (the front carriage being deprived of it), dashes on, smashing those in front: but when the last carriage is the first stopped, after the actual moving power is cut off, this can never occur." This invention does not entail the necessity of making any alteration in the rails or carriages, except the luggage one (to which *the apparatus* may be attached for a mere trifle), nor is it intended to

supersede the use of the ordinary breaks on ordinary occasions; its great merit being that it is adapted to do that which the means at present employed are incapable of accomplishing. As tested by the model, the invention is perfectly successful, and extremely well adapted to the purpose to which it is designed; but its efficacy, when applied in its full force with the enormous power and speed of a train of carriages opposed to it, of course, remains to be proved. The second part of the invention consists in placing a simple elastic strap, (to be hooked or unhooked at pleasure,) in front of the passengers, for the purpose of preventing them from being dashed together, or against the sides of the carriages.—*Daily News.*

CRAMPTON'S LOCOMOTIVE ENGINES.

A PAPER has been read to the Institution of Civil Engineers on the Construction of Locomotive Engines; especially those modifications which enable additional power to be gained without materially increasing the weight, or unduly elevating the centre of gravity, by Mr. T. R. Crampton.

Upon two subsequent evenings, a discussion was kept up on the merits of these engines; and instances were adduced supporting the views of both sides, but without arriving at any result other than that it was desirable to lower the centre of gravity, in order to establish a great angle of stability, and to arrive at a ratio between the circumference of the driving wheel and the cubic content of the cylinders, such as whilst the greatest speed might be maintained, with an economical consumption of fuel, every facility should be afforded for starting rapidly. On the one hand, it was argued that small driving wheels were essential for quick starting; and on the other hand, it was contended, that with a given amount of evaporating surface in the boiler, the tractive power would be the same under all circumstances at the periphery of the driving wheel; provided a given relative proportion existed between the cubic content of the cylinder and the circumference of the driving wheel, and that large wheels reduced the wear and tear. The diminution of the wear and tear of the sides of the brasses of the engines, having the driving wheels behind and the greatest weight upon the extremities, leaving a comparatively light load on the centre wheels, was adduced as a proof of their stability—an engine of that kind having run 25,000 miles without any appreciable lateral wear; whereas, an ordinary engine on the same railway had worn away a thickness of a quarter of an inch whilst running the same distance.

ARMSTRONG'S HYDRO-ELECTRIC ENGINE.

THE wonderful power of this machine has been tested at the Polytechnic Institution, Regent Street. As there remarked by the lecturer, the old machine used at that institution in exemplification of the great power of Electricity, large and astonishing as its results once appeared, is a mere toy in comparison with this potent rival. And yet it is but a small locomotive boiler. It is mounted on six glass

pillars, and contains its fire in the interior. Along the upper part of one side is a numerous series of jet pipes, through which the steam rushes, and in which, condensing into water, it evolves the electricity. These jets are worked by handles on the opposite side, so as to allow of either the whole power, or a part only, being set on. The long streaks of light which shoot from all parts of the surface when a sparking rod is directed towards the boiler, can no longer, with the least propriety, go under the name of mere sparks; they are no mean semblance of the forked lightning of nature itself, and our respect for the dartings, which are displayed in darkness, is by no means diminished by the dread shriek of "hell in harness" which ever accompanies them here, as the storm-shriek often does in Nature's lightning-play. A powerful battery of the usual order is charged by this machine almost in a moment, suddenly exploding bell-wires into smoke.—*Builder*, No. 346.

FELL'S NEW SYSTEM OF PROPULSION.

In this system, the Motive Power is that of compressed air. A stationary engine communicates with a cast-iron pipe placed between the rails along the whole length of the line; and, by this means, air-vessels of requisite size, placed at certain distances along the pipe, are filled with air of the wished for density. These air-vessels (to speak popularly) supply the momentum to the engine-truck, a lever bar attached to the truck opening, as it passes along, a valve or cock, which causes the compressed air to escape into a "chamber" running along the under part of the truck, and thus to become available for propulsion. As regards cost, the calculation is, that it will be 50 per cent. less than that of steam.—*Morning Post.*

FRICTION OF WATER.

A paper on this subject, by Mr. R. Rawson, has been read to the British Association; its object being to ascertain the Friction of Water on a vessel or other floating bodies rolling in water. For this purpose, experiments have been made upon a cylindrical model whose length is 30 ins., diameter 26 ins., and weight 255·43 lb avoirdupois, in the following manner:—The cylinder was placed in a cistern, in the first place, without water, and made to vibrate on knife-edges passing through the axis of the cylinder. A pencil, projecting from the model in the direction of the axis of the cylinder on the surface of another moveable cylinder, marked out upon paper placed upon this last cylinder the amplitude of each oscillation. The cylinder was deflected over to various angles by means of a weight attached by a string to the arm of a lever fixed to the cylindrical model:—

Angle of Deflection.	Angle to which the Model vibrated.
22 deg. 30 min.	22 deg. 24 min.
22 " 10 "	22 " 6 "
21 " 54 "	21 " 48 "
21 " 36 "	21 " 30 "
&c.	&c.

When the cylinder oscillated, in all circumstances the same as above, except being surrounded by salt water, the amplitudes of oscillations were as follows:—

Angle of Deflection.		Angle to which the Model vibrated.
22 deg. 30 min.	....	22 deg. 0 min.
21 " 36 "	....	21 " 3 "
20 " 48 "	....	20 " 16 "
&c.		&c.

Clearly showing that the amplitude of vibration when oscillating in water is considerably less than when oscillating without water. In the above instance, there is a falling off in the angle of amplitude of 24′, or nearly half of a degree. This amount has been confirmed by several experiments made with great care; and it appears only fair to attribute this decrease in the amplitude of oscillation to the circumstance of the friction of the water on the surface of the cylinder. The amount of force acting on the surface of the cylinder necessary to cause the decrease in the amplitude of oscillation shown by the experiment was calculated; and the author thinks that such amount of force is not equally distributed on the surface of the cylinder. In consequence of this, he thought the amount on any particular part might vary as the depth. On this supposition, a constant pressure at a unit of depth is assumed. This, multiplied by the depth of any other point of the cylinder immersed in the water, will give the pressure at that point. These forces or moments being summed by integration, and equated with the sum of the moments given by the experiments, we shall have the following value of the constant pressure at a unit of depth, ·0000469. This constant is another experiment; the weight of the model being 197 lbs. avoirdupois; and consequently, the part immersed in the water was very different from the other experiment, was ·0000452, which differs very little from the former, showing that the hypothesis assumed in the computation is not far from the truth.

OSCILLATIONS OF FLOATING BODIES.

Mr. Rawson has also read to the British Association, a paper having for its object the description of a course of experiments made at Portsmouth Dockyard by Mr. John Fincham, (the master shipwright,) and the author, with a view to confirm several important formulæ discovered by Professor Mosely relative to the rolling and pitching motion of vessels. All the experiments, which were made by Admiralty order, confirm the formulæ for determining the amount of force or work done to deflect a floating body in a state of equilibrium through a given angle, and also another formula which determines whether the vessel thus deflected will move slowly or otherwise. The importance of these questions to naval architecture is obvious; and all the experiments we have made, show what we believe to be an important *practical fact, viz., that when a sudden gust of wind is applied to the sails of a vessel, or* any cause which acts constantly during one

oscillation, the ultimate amplitude of deflexion will be double the amplitude which the gust of wind will permanently deflect the vessel. In the next part, several experiments were made on models of vessels; some of which have been built with a view to ascertain the best form of midship section which will give the easiest rolling motion.

PORTLAND BREAKWATER.—CONVICT ESTABLISHMENT.

THE foundation-stone of this national work was laid by Prince Albert, on Wednesday, July 25th. The stone was a block weighing 14 tons; it was suspended by an iron chain, and, being let slip after a bottle containing a plan of the Breakwater, specimens of the coinage, &c. had been deposited, it fell to the bottom of the sea, in the midst of a drenching shower of spray, and a noise like thunder.

The construction of this breakwater, as many of our readers are aware, is not a new idea. It was first proposed by Mr. John Harvey, mechanic to George III., and afterwards postmaster at Weymouth; and after whose death the subject continued in agitation partly by the efforts of Mr. Harvey's son. The attention of Government, however, was not steadily fixed upon the matter until 1846, when the Refuge Harbour Commission reported very strongly in its favour. But the work was not decided on, even then, until a second Commission had confirmed the recommendation of the first, and pointed out the advantages which the proposed breakwater would secure. The necessary surveys were then made, and powers for the compulsory purchase of land obtained by act of parliament; after which, Mr. Rendell, Civil Engineer, was authorised to prepare a design of the work. As planned by Mr. Rendell, it will shelter an area of 1,822 acres from the only wind to which it is exposed. From the eastern point of the island, it will run out 1,500 feet in an easterly direction, and then going off at an angle will be carried 6,000 feet to the north-east. At the angle there will be an opening of from 400 to 500 feet, for the use of steamers and small craft; but the whole work will be 7,900 feet, or one mile four furlongs in length. Of this more than 7,000 feet will be built in from 5 to 8½ fathoms' depth at low water. Of the whole area, there will be 1,544 acres having not less than five fathoms' average depth, and 1,072 acres with 6½ fathoms' average depth: thus making accommodation for the largest channel fleets and convoys known during the last continental war. From the facilities which the stone quarries on the island afford for the work, and the intended employment of convict labour for quarrying the stone and loading the waggons, the estimated cost is only £560,000. A railway, with three inclines, drums, wire-ropes, &c., will raise or lower the waggons, and carry stones from the top of the island to the spot where they are dropped into the sea. By means of self-registering "weigh-bridges," the weight of stone put into the breakwater can be exactly ascertained.

This great work is to be constructed by convicts: some in quarrying, others in squaring stone, others in making new roads and levelling the quarries for laying down the rails preparatory to the

removal of the stone to the breakwater. The establishment, which can only be seen by an order from the Secretary of State, is constructed chiefly of wood and iron, so that it may be taken down and removed on the completion of the breakwater. Each man has a second separate sleeping cell, about seven feet long by four feet wide and seven feet high. These small cells are ranged four stories high, and open into four spacious halls, which are so placed as to be under inspection from a central corridor, where the officers are stationed. All the necessary offices are placed in an adjoining building, where there is a large cookhouse, washhouse, and drying-shed, baths, &c. There are also a large chapel and other buildings; and the entire place is inclosed by a lofty wall at the edge of the quarry. On the outside are houses for the governor, chaplain, and superior officers; and extensive ranges of cottages for warders and others. There is also a large infirmary, protected from the prevailing winds by having been built in a large quarry. Instead of going to the expense of breaking up the large stones, and levelling the yard where the sick will take exercise, the rocks have been left, and a party of convicts, under the direction of a governor, have made walks among them. There is a gasometer, from which all the buildings are lighted, and the supply of water is pumped up from a reservoir about 350 feet below the top of the rock.—*Builder*, No. 339.

THE PLYMOUTH BREAKWATER.

SIR JOHN RENNIE has published a magnificent "historical, practical, and theoretical account," of this stupendous work, which we find thus ably characterized in the *Athenæum*, No. 1117:—

It is impossible to look down without wonder from the heights of Devonport on the magnificent basins that run far inland on every side, and offer to the ships of the British Navy many square miles of still and deep water where they may lie securely sheltered from any wind that can blow. Vast natural quays run down suddenly into deep water, and enable ships even of the largest size to come close up to them for receiving their stores, landing troops, &c. conferring all the advantages of the most perfect harbour. Nature might seem to have planned and excavated these deep ravines with the express design of forming havens for refuge and defence for some great maritime power. The whole coasts of the opposite Continent present no single instance of such a harbour, either for extent, shelter, depth, or ease of access and egress. Screened by high lands from every side, except the south, Nature has placed in that quarter shallows, which at least break and mitigate the violence of the waves; leaving both to east and west of them such wide and direct entrances as can be made safely in all weathers. The entrance to Plymouth Sound is some three miles broad, and it extends inward nearly as far; giving between four and five thousand acres of deep water, from which extend out various subsidiary bays and creeks of considerable extent. It consists of three divisions, each containing fine capacious natural harbours: viz. two inner ones on the west, called the Hamoaze, and the Tamar and Mill

Bay,—on the east, Sutton Pool, Catwater, and the channels of the Laira and Plym rivers. The outer harbour consists of the Sound, of Beenpool and Cawsands Bay on the west, and Bovisand and Staddons Bays on the east. The great extent and depth of water, good anchorage, and excellent shelter to be fonnd in these harbours, and their situation close to the entrance of the British Channel, give to Plymouth an importance which has long ranked it as the first of our harbours.

So early as 1806, under the late Earl Grey (then Lord Howick), as First Lord of the Admiralty, it was resolved to add to the natural advantages of Plymouth Sound a great work of art, to complete its protection in that only direction where Nature had left it imperfect. Messrs. Rennie and Whidbey proposed to erect in the centre of the entrance of the Sound a great isolated Mole or Breakwater. The scheme, after much discussion and some delay, was finally approved; and Mr. Rennie was ordered in 1812 to carry it into execution. This great artificial island or mole is not less than one mile long. It contains no fewer than three and a half millions of tons weight of rubble stone, quarried in the adjacent hills, and deposited in the sea at a depth of from thirty-six feet below low water, to ten feet above high high water. Besides this, there is a dressed stone pier or platform running along the top, containing two and a half millions of cubic feet of dressed stone. The cost was a million and a half of sterling money, and the work has no parallel in the hydraulic architecture of any kingdom. Some idea of the mass of stones combined together to form the Plymouth breakwater may be formed by imagining that if piled up over the area of Trafalgar Square, they would form a pyramid 600 feet high,—a height exceeding that of Nelson's monument standing on the top of St. Paul's.

One of the most curious and valuable parts of this work consists of a series of outlines of the breakwater taken at different stages of its progress. For the most part the waves themselves have built up the breakwater,—that is to say, they have been allowed to give it very much what form they pleased, the engineer doing little more than handing the materials for them to work upon in the place where he wanted the work done. This work, like Cherbourg, was chiefly executed with rough stone—arranged originally with an approximate intention of form. That form the waves modified to suit their own forces; and what form they indicated has been carefully watched, and its changes from time to time put on record. In these records Nature speaks; and there the engineer may learn his lesson. The various diagrams which trace the progress of the work under the action of the sea, extend regularly over the first twelve years, and some come down to a recent period.

SMITH'S YIELDING BARRIERS, FOR HARBOURS OF REFUGE.

The extensive discussion which the cognate subjects of Refuge *Harbours and Sea* Walls has recently undergone, has induced Mr. *W. H. Smith, C.E., to* recal the attention of the public to an Elastic *Mooring for Breakwaters*, which he patented a few years ago, the prin-

ciple of which he thinks equally applicable to marine barriers of every description,—floating docks only excepted.

The plan here brought forward is perfectly original, and differs essentially both in principle and operation from all piers or sea-walls hitherto advocated. Instead of withstanding the shock of the sea, it at once eludes its power; and this, from the example of Nature herself, which is ever the safest handbook to practical science. Smeaton, in the first marine work of the kind that has ever succeeded, closely copied nature. He took for his model the trunk of the majestic oak, with its spreading base and gradually tapering stem, and he triumphed. The discoverer of this system has a parallel precisely analogous, and of equal or more force. The pliancy of the branches of some of the weakest trees—the willow, for instance—enables them to spring before the most violent blast, and return to their place in the lull of the storm; whilst the most stubborn, as the oak in the fable, from their unyielding nature are destroyed—the very fate as well as character of our present harbours.

This yielding principle is adopted in the proposed plan, and is found to be of even more value to sea structures; the waves being intermittent, and thus striking and recoiling more regularly than the blasts of the gale. Since the days of Dibdin it has passed into a proverb, that a tight ship, and good sea room, imply perfect safety; or, in other words, that the sea has no power of injuring a vessel so long as she can yield to its shock: thus a ship, an empty cask, or the most fragile body, may drift at sea in a gale with safety. Such is peculiarly the principle of this invention. It yields freely in the first instance to each wave as it is swept forward, gradually increasing its resistance, until at length the momentum of the latter is absorbed, it becomes reduced and disseminated, and the yielding framework recoils to meet by a similar operation each successive wave.

Mr. Smith's yielding bulwark may be thus briefly described:—It consists of a hollow framework of timber (a floaking breakwater, in fact, with gangway at top), which is secured to the ground by screw piles (Mitchell's patent), but *is free to oscillate on these piles*, within certain limits, determined by mooring blocks and counterbalance weights, thrown out to seaward.—*Mechanics' Magazine*, No. 1331.

FLOATING RAILWAY BRIDGE FOR THE FRITH OF TAY.

THIS novel work of naval architecture has had her engines fitted at Mr. Napier's dock, at Lancefield. The vessel is of iron, 175 feet long, 34 feet broad, and 10 feet deep, the bottom being a very flat curve; both ends are alike, and quite square, so as to abut against the quay, and receive the trains on deck from either end. The deck is flush, and clear fore and aft, and on it are three lines of rails, so as to enable it to take the longest train likely to require it. The steering wheel is amidship, elevated between the paddle-boxes, and connected with the rudders at each end by long chains: as the vessel will not be turned, these rudders will, of course, be used alternately, as either end becomes the stern. There are two engines entirely independent of

each other, and instead of a shaft connecting the paddles, each i moved solely by one engine, by which means extraordinary comman is obtained over the movements of the gigantic machine, independen of the rudders. The diameter of the cylinders is 56 inches, with 3 feet 6 inches stroke; the valves work with great ease, and eac engine is 100-horse power. The valve gear is on deck; there are tw eccentrics which are thrown alternately in and out of gear, as eithe end of the vessel becomes in turn the head. The boilers are amidship with a clear space all round for facility of cleansing and repairs. Sh draws but little water, made eight knots per hour, and is expected t be in operation in two months. As a proof of the mathematical cor rectness in the construction of machinery at the present day, it may b stated, that when the engines were started for the first time on actu work, they immediately worked to perfection, and not a screw had t be altered during the trip. There are two small extra pumps for sup plying the boilers, in case of the water running low, and every pre caution appears to have been taken to prevent accident. At Mr Napier's works have been shown two steam-engine cylinders, stated t be the largest yet constructed, being 96 inches diameter, intende for the American mail steamers, *Asia* and *Africa*, the engines bein nearly 900 horse power.

A NEW RIG.

At Boston, U. S., a pamphlet on Ship Rigging has been lately pub lished by Captain R. B. Forbes, the originator of numerous inventior and recommendations of improvements in ships, as to model, steerin chain-cables, pumps, windlasses, compass-lights, lightning-conductor life-boats, life-buoys, and life-preservers. His last achievement is n exactly "a wheel-rigged ship," for halt and blind management, but simplification of the usual troublesome process of "taking in a reef. Without reducing the surface of canvas necessary to propel the shi he has so arranged it, that the topsails and maintop gallant sail hav only a single reef in each, which, once in, renders the ship as snug if under close reefs of the old rig; and this is accomplished by havir long lower mast heads, upon which the first topsails are set. His ri in fact, has two topsails upon each topmast, one above, and the oth below the cap. The nautical reader will, therefore, probably be opinion that the upper topsail can always be carried to the la moment, simply because it can be easily taken in, and that then, witl out reefing at all, the ship is at once equal to one of the old rig, und double reefs. His yards, too, on the fore and mainmast, are, all b one, of the same dimensions—an advantage, it is conceived, of no ord nary importance in the event of disaster aloft. This new rig, it said, has been fully tested.

BOAT FOR THE PRINCE OF WALES.

Mr. H. G. Robinson, Captain Light, Captain Smith, R.N., a *Mr. C. Manby, Secretary* of the Institution of Civil Engineers, ha presented to the Prince of Wales, a beautiful Life-boat, constructed

liar principle. The following are the dimensions of the boat:— over all 20 ft. ; ditto on the keel 17 ft. 4 in.; breadth main thwart 3 ft. 2¾ in.; ditto at the back-board thwart 2 ft. n.; ditto at the rowlock 3 ft. 7½; depth 11¼ in.

was built by Messrs. George Searle and Sons, of Lambeth, boaters to Her Majesty, and is constructed of bird's-eye maple, the s, saxboards, and thwarts, being of Spanish mahogany; her keel-, stem-bend, and rudder-hangings, are of bronze; the rudder of e, with a carved yoke, gilt, and silk lines and tassels of crimson old colour. She is also fitted with an elegantly carved chair. sculls are of mahogany, and very light. The boat, which is a gle sculling skiff," is lined throughout between the timbers with ain Light's patent material, which gives to her all the buoyancy other properties of a life-boat.

some recent trials of this principle on the boats for the Preven- Service at Deal, it was found to render them extremely buoyant, at the same time to stiffen them very much under canvas.

e experiments showed, that boats lined with Light's buoyancy rial, were capable of carrying a full complement of hands with more dead weight than usual, and yet, when filled gunwale deep water, they could not be submerged. The same principle has extensively used in the construction of swimming belts, life-buoys, and for the stuffing of yacht cushions, mattresses, &c.; and as aterial used is merely light tough rushes, properly prepared, and three-fifths the weight of cork, no injury can ensue from punc- or cutting, as with air cushions, or the destruction of the elasti- as in the case with the cork shavings. Two beautiful specimens imming belts, and small life-buoys, were presented with the boat, e use of His Royal Highness.

RAVAGES OF THE SHIP-WORM.

ERE has been read to the Institution of Civil Engineers, a cription of the Old Southend Pier-head, and the extension of er; with an Inquiry into the Nature and Ravages of the *Teredo lis*, and the means hitherto adopted for preventing its attacks," by ohn Paton. A general outline of the extension of the pier, and a e description of the pier-head, were given, showing the means ed by the use of iron piles, and by scupper-nailing the inner to preserve the structure from decay. As to the *Teredo*, the isions arrived at were, that the ravages of the marine worm were revented by any chemical application, and that nothing but nical means could ever prove completely successful; studding road-headed nails was considered to be the most effectual remedy.

a subsequent discussion on the subject, the "Pholas" was to have been in active operation upon certain rocks from earliest periods, but never upon Portland stone. Hence s argued, that that kind of stone should be used for waters and other works exposed to the action of the *This bearing of the discussion* induced remarks upon the ravages

of the white ant of India; which, however, appeared to h
little studied, and less understood, as far as attempting to arr
prevent its inroads. Specimens of piles from Lowestoft
whose waters were notoriously full of worm, showed that tin
natural state was in a few months thoroughly perforated by "
in the centre, and "Limnoria" on the surface; but that pil
had been properly saturated according to Bethell's system, in e
receivers, and subjected to such pressure as insured the absoı
about ten pounds weight of the creosote, or oil of coal tar,
cubic foot of the timber, were perfectly preserved from attacks
animals of any kind.—*Builder*, No. 537.

PORTE-AMARRE IN SHIPWRECK.

The shell of Capt. Manby, and the rockets of Mr. Trengr
Lieut. Carte, have long been familiar to us as inventions of con
merit, designed for the purpose of carrying ropes from the si
stranded ship, and thus forming a communication, by means
many lives have been saved. Capt. Delvigne, of the French
recently introduced a modification of these plans of a very ingeni
Instead of the shell or rocket drawing the rocket or cord aft
Delvigne has made a projectile of the cord itself, wound upor
gated cylinder of wood. As this *Porte-Amarre*, as it is calle
from a carronade, the rope is rapidly unwound,—and the wood
der falling across the vessel, the desired communication is effe
if it falls in the water, it floats, and may be secured in cases
shells or rockets would sink. Experiments have been made at I
and it is stated that the *Porte-Amarre* is less affected by the w
consequently less subject to a deviation from the true path, th
the shell or the rocket.—*Athenæum*, No. 1121.

IMPORTANT DISCOVERY IN NAVIGATION.

The *Detroit Commercial Bulletin* states:—Mr. A. A. W
this city, has perfected one of the most simple instruments im
for the purpose of determining the lee-way which a vessel
making at all times while on her voyage; by which the la
a ship can always be determined without the usual observati
with no other trouble than simply referring to the log for
run, where the workings of the "indicator" are regularly
Indeed, so perfect and useful is this invention, that with it an
point may be made after taking the usual bearings, notwith
the vessel may be making the greatest rate of lee-way, as her co
be altered to meet the variations marked out by the indicat
wheelman. The contrivance is as simple as the inventior
portant, and as sure to record its lee-way as the compass is to
the vessel's bearing. It consists of a tube four inches in d
running down from the binnacle of a vessel to the keel, throu
passes a rod, and to which is attached immediately under th
vane, about eight inches deep, and two feet long. This being
water, is asserted to be operated upon by any lee-way th

may make, which is indicated by the needle at the top of the rod, placed upon a plate on which the degrees are marked, situated between the two compasses in the binnacle. The instrument has been shown to nautical gentlemen of Detroit, and to officers of the navy; and all seem unanimously to concur in opinion that, next to the compass itself, the invention of Mr. Wilder is the most useful instrument in the art of navigation.

ADMIRALTY CHRONOMETERS.

We collect the following particulars from a return to a recent Order of the House of Commons:—

The number of Chronometers allowed to be placed on trial at the Royal Observatory, Greenwich, during the last five years, has been 219.

In 1845 the first, in point of merit was			Poole...... (1155)
— 1846	..	..	Hutton.... (138)
— 1847	..	..	Frodsham.. (2074)
— 1848	..	..	Hewitt.... (1177)
— 1849	..	..	Eiffe...... (662)

Of the 219 placed on trial, 79 were afterwards purchased for the public use. The highest prices given were, £68. 5s. for Hutton (138), and the like sum for Frodsham (2074). Twenty-one obtained only £42, and a few much less. The largest number purchased from any one maker was 14, from Loseby, but owing, apparently, to other circumstances than the position which that gentleman held in the competition.

Mr. Loseby is the inventor of a chronometer compensation of great merit, and it was avowedly to reward him (in some measure) for that invention, that the Admiralty gave him such a preference in their orders. The defect in chronometers, which it was the object of Mr. Loseby's invention to remove, and which it is admitted to have removed most successfully, was this—that if the compensation is perfectly adjusted for very high and very low temperatures, the chronometer *gains* at middle temperatures. The way in which Mr. Loseby rectifies this defect is, to attach to the balances of his chronometers curved tubes containing mercury.* The mercury, on expanding with an increasing temperature, arrives in parts of the tubes inclined in different degrees to the radii of the balance, and therefore its successive expansions produce successive effects of different magnitude on the momentum of the inertia of the balance; and by giving different forms to the tubes containing the mercury, the law of the successive alterations of the momentum of inertia may be made to adapt itself to the law of alteration of the elasticity of the spring, whatever that law may be. The Astronomer Royal (Mr. Airy), in reporting to the Admiralty on this compensation (28th May, 1845), says—" I consider this contrivance (taking advantage very happily of the two distinguishing properties of mercury, its fluidity and its great thermal expansion), as the most ingenious I have seen, and the most perfectly adaptable to the wants of chronometers. I am not aware that it is liable to any

* See *Year-book of Facts*, 1849, p. 15.

special inconvenience." He was pleased at the same time to ad "No construction whatever for *this purpose*, however successful, now, in my opinion, claim any pecuniary reward." And in a su quent report (19th Feb., 1846), he gives this as his reason : "The ture of the defect, and of the modes of remedying it, were pointe strongly and clearly by Eiffe, and contrivances for correcting it very considerable degree of exactness were actually adjusted by and after this has been once done, the merit of arranging a new a ratus for the same purpose, however ingenious (and Mr. Loseb very ingenious), is very small." Mr. Airy, therefore, gave it opinion, that "the Admiralty should give encouragement to Lo not by giving him money (for a grant of which application had made), *but by applying to him for a few additional chronomet* The Admiralty followed the Astronomer Royal's recommendation in the opinion of another important functionary (the Hydrogra they have done all that the circumstances of the case warranted.

"The statement of the Astronomer Royal," says the Hydrogra Admiral Beaufort, "is perfectly correct. In his Report, May he distinctly said that no construction for the purpose that Loseby had in view ought to be pecuniarily rewarded ; but, for obvious reasons, their Lordships did not think it prudent to est that as an inflexible rule, and much less to publish it.

"The immediate purpose of Mr. Loseby's construction w resist great changes of temperature, in which he had been in measure anticipated by Mr. Eiffe ; and the agent that Mr. L adopted, mercury, had been already applied by M. Le Roy : y means by which Mr. Loseby employed that agent were new an ingenious.

"Ultimate success, however, could not be proved by short art trials at home ; and therefore the Admiralty, though refusing direct reward, have afforded him, by spreading his chronon through all climates, the best and most satisfactory means of esta ing the merits of his invention.

"In doing this, they have carried out the Astronomer Royal's ciple of encouragement, and to a great extent, as they have purc thirteen of Mr. Loseby's chronometers, and paid him for them £ —*Mechanics' Magazine*, No. 1366.

TANNER'S POLHORION CLOCK.

The peculiarity of this "Polhorion" (*many hour*) Clock consi its exhibiting on the same dial-plate, but in distinct circles, no Greenwich time, but the corresponding time at as many other as there are circles. The whole of the different times are regulat one movement and pendulum ; and the clock can be made to sho hours either with or without an hour hand. Thus, suppose a set to exhibit the times at four different places—namely, Poir Lucar, California, 109° 54′ W.L. 7h 19′ slow ; Quebec, 71° 4h 44′ slow ; Madras, 85° 22′ E. 5h 21′ fast ; and Sydney, 151 *10h 5′ fast*. In the circles 11 and 5, the times are indicated

and; in the others by the minute hand. When the minute rrives at 60 in each revolution, the hour immediately changes next in succession, as 10 for 9, 11 for 10, &c. The construc- the clock is stated to be so "simple that it is not liable to get order, and if forgotten to be wound up, by setting the centre r hand to its proper time, the whole are set to their respective ' No details of the interior machinery are given; and probably e needed for persons familiar with this branch of mechanical *Mechanics' Magazine*, No. 1334.

THE COMMON WATCH.

Common Watch is in many of its parts a very ill-constructed e. The train of wheelwork which transmits the motion of the ring, for example, is contrived on principles so faulty that they be scouted by every practised mechanician. Yet there can be ot that any attempt to introduce a better machine would utterly a commercial enterprise. Long-used methods and ingenious have been specially provided to fashion and cut every one of uter parts which go to compose the existing instrument. Mr. n a lecture delivered at the Royal Institution, stated that every onsisted of at least 202 pieces, employing probably 215 per- stributed among forty trades—to say nothing of the tool-makers of these. If we were now materially to alter the construction of tch, all those trades would have to be relearnt, new tools and cutting engines to be devised,—and the majority of the work- begin life again. During this interval the price of the new in- nt would be enormously enhanced. We should again hear men like Malvolio, of "winding up their watches" as a token of cent wealth. Thus, in our complicated state of society, even es in the process of time come to surround themselves with a f "vested interests" which embarrass all our attempts at im- ent.—*Edinburgh Review*.

HYDRAULIC CRANE.

s is a novel application of the pressure of water in air-tight s a motive force. A Model Engine of this kind has been at the Gorbals Gravitation Water Company's premises in w. "It is about one-horse power, with a horizontal cylinder, ving a twelve-inch stroke. The water, which here has a pres- about 210 feet, is introduced to it from a common house-pipe; h is the simplicity of the machine, that a child could work it gulate its speed at pleasure by the mere turning of a handle. eat advantage of this engine consists in the fact that it can be in any flat of a house of any street—wherever, in fact, there is -pipe. It takes up very little room; it registers the quantity r it uses (which, by the way, may be again available for several es, as it leaves the engine as pure as when it entered); and it erected in those localities in cities where steam-power is pro- *on account of danger* and nuisance from smoke, and without

raising the rate of insurance. It will be much cheaper in every respect than a steam-power engine. The model has been constructed by Messrs. James Steel and Sons, Dundee. In all processes requiring engines of from two to six or eight horse power, such as coffee-grinding, baking, turning, letter-press machine printing, &c., the gravitating water-power engine is expected to speedily come into general use.—*Glasgow Citizen.*

CENTRIFUGAL PUMP.

THIS machine has been invented by Mr. Appold, for Draining Marshes, &c. It contains a wheel resembling that of the turbine, made of tin, a little thicker but no larger than a halfpenny. This is fitted at the bottom of a square tube dipping into a small cistern containing water, which may represent a lake, &c. The wheel being made to rotate with great velocity, throws up water rapidly into the tube above itself, until it overflows in a continuous stream at the top, and the volume of its stream is such as to deliver *eight* gallons per minute; and on applying a nozzle, the stream is driven to a distance of twenty feet. This is a marvellous effect, from so apparently insignificant a cause; but a wheel about fifteen inches in diameter, exhibited at the same time, will deliver 1800 gallons per minute; it requires to be worked by an engine of four-horse power. Mr. Appold has proposed to the engineer of the Dutch Government to fix a similar wheel on the Haarlem Sea, now in process of being dried by forty pumps driven by steam. A centrifugal pump of forty feet in diameter would do more work than all the others put together, and would deliver—so the inventor asserts—1,500,000 gallons per minute.

SIMS'S STEAM OR HYDRAULIC WHEEL.

IN the Annual Report for 1848 of the Royal Cornwall Polytechnic Society, Mr. J. Sims, of Redruth, describes a Working Model of his new Steam or Hydraulic Wheel, to be worked by steam or water power. As a steam wheel or rotatory engine, it appears to surpass all former attempts of the kind; as in this engine, the motive power is in the piston and cylinder of the ordinary construction of Bolton and Watt's engine; while the expansion principle of cutting off the steam is carried to a greater extent than in those engines, and is accomplished by the motion of the piston being independent of the motion of the wheels, and almost instantaneous. In the great variety of rotatory or steam wheels that had hitherto come before the public, not any of the inventors had availed himself of the benefit of working with the ordinary cylinder and piston, and they had therefore failed to carry out the expansion principle, and also to prevent the leakage of steam, at the extremity of those attempted with vanes,—the disc engine and various others. In some, packing had been attempted; but here the friction was so great and the wear so rapid, that hitherto not one had succeeded well. In the present model, it will be observed that in the revolution of the wheel, when the cylinder comes to a perpendicular position, the steam is admitted underneath the piston

the same time it escapes from the top side, thereby shifting the ;ht to the top of the wheel, and causing it to revolve by the pre-derance of the weight. The power of the engine being the amount reight moved a certain number of feet in a given time, regularity notion is essential, and may be accomplished by a good governor. blow against the buffers is in proportion to the extra quantity of n admitted, and is on the same principle as the ordinary reci-ating or pumping engine. As an hydraulic engine, this invention ceedingly well adapted for situations where a good height of water e obtained, but at the same time not in sufficient quantity for ordinary kind of water-wheel. The water can be conveyed in , when a very small stream can be made available in proportion height and quantity. It will be admitted into the cylinder in ame way as steam is admitted, thereby shifting the weights and ng a very effective and economical water-wheel, as every pound ter will be used. The velocity of the wheel will be much su-r to that of the ordinary water-wheel, and in proportion to the t and consequent pressure and quantity of water obtainable. So ts velocity as a steam wheel will depend on the pressure of steam, tting the shifting of weights, however quick the passing of the ure for the admission of the steam.

HIGH-PRESSURE STEAM IN MARINE ENGINES.

R. J. SEAWARD has communicated to the Institution of Civil neers, a paper "On the Employment of High-pressure Steam, ing expansively, in Marine Engines;" describ d as the sub-e of a reply, by the author, to questions proposed by the Secretary e Admiralty. It first reviewed the mode of working marine es for some years past, and noticed the gradual change that had rred,—particularly the tendency to use high-pressure steam in- of that of a pressure of about four pounds above the atmosphere. en examined the system of cutting off the steam at various parts e stroke; and as at the same time a remarkable augmentation occurred in the speed of the vessels, which was naturally attri-d to that cause, it inquired into these several causes and effects, ell as into the reduction in the consumption of fuel which took . In this examination, all the arguments for and against the f high steam, and on the presumed gain or loss of mechanical r in the use of the expansion principle in the cylinder, were can-d; and the paper wound up with the replies of the author to the questions from the Admiralty, to this effect:—"The highest sure of steam that we have, in any case, put upon a marine boiler ur own construction, was about 16 lb. to the square inch; but re not inclined to repeat the experiment, as we feel assured that an obtain equally good results with steam of a lower pressure. n 10 to 12 lb. is the usual pressure we employ in the merchant ice for engines and boilers of comparative small power. The m pressure at present employed in the service is about 8 lb. per re inch. *We consider steam* of this pressure to be well adapted

for the exigencies of the service; we believe it is calculated to se all the important advantages of power, economy of weight and s| in a very eminent degree: these advantages will in some respec slightly increased by augmenting the steam pressure to 10 or 1 to the square inch. We strongly recommend that the steam empl in the Navy should not be of greater pressure than 10 lb. per s(inch, or in extreme cases 12 lb. to the square inch; any materi crease to the latter pressure will be attended with considerable without any adequate advantage." In the discussion which en these propositions were to a certain extent concurred in, but limitations as to the introduction of other forms of boilers; i also explained that the arguments were applicable only to conde engines working expansively,—and therefore left the question o introduction of the use of high-pressure non-condensing engines untouched, and free for discussion at a future period.

SUPPLY OF STEAM-ENGINE BOILERS.

A PAPER has been read to the Mechanical Section of the B Association, "On a Method of supplying the Boilers of Steam gines with Water," by Mr. W. S. Ward. Mr. Ward's suggest to use a small supplementary pumping engine, having a workin linder with valves so arranged that the piston may be put in m by either steam or water passing through it; to be fed with s by a steam pipe, the entrance to which is somewhat narrow, ar serted in the boiler to be supplied a little above the level at wh is desired to maintain the water therein. Such aperture shoul be about the centre of a marine boiler. The working cylinder sl be attached to a pump of such size as to be easily worked by the sure of the steam. The exit pipe of the steam cylinder must cor nicate with the inlet pipe of the pump, so that if the cylind actuated by steam, the steam will be condensed, and its heat cor nicated to the water to be supplied to the boiler; or if the wo cylinder be worked by water proceeding from the boiler, a conside part of such hot water will be returned by the pump. The mo operation of such apparatus will be, that whenever there is a wo pressure of steam in the boiler, the apparatus will be in action if the level of the water be below the aperture of the small steam the action will be moderately rapid, and a supply of water be pu into the boiler; and when the water in the boiler rises to the aper this being small, will be as though choked by the water, which w forced through the working cylinder, moving the piston and p very slowly; a portion of the water thus escaping from the boile be returned by the pump. Such last-mentioned action cannot tinue long, inasmuch as the level of the water must be reduced; tl fore the average level of the water in the boiler will be, with s oscillations, maintained at the height of the supply pipe.

In the course of a brief discussion which followed, the Presi said that the above was a new and ingenious idea, but one whic *was afraid was* not practically useful.—*Athenæum*, No. 1142.

BISHOPP'S DISC ENGINE.

he *Times* Printing-office,* a new "Disc Engine" has been put ve Applegath's two Rotatory Printing Machines, by which copies, or thereabouts, are worked off at the rate of 5000 te copies per hour. In this engine, the advantages of have been long known, the objections that alone kept it out eral use appear to have been successfully overcome. It is a se power engine, on the high-pressure and condensing prin- it is, however, equally suitable to be worked as a simple essure condensing engine. It stands in the machine-room to a wall, and occupies a singularly small space — seven ng and four feet wide—and the highest part of the engine is ree feet above the floor of the room. The arrangements lately d by Mr. G. D. Bishopp have so much improved it as to open much larger sphere of action. The engine at the *Times* office was ctured by Messrs. Joseph Whitworth and Co., of Manchester. peculiarity of the disc engine is, that it gives direct motion to a on the engine shaft, and exerts a perfectly uniform force on it hout the revolution. There are, therefore, no "dead points;" en driving by gearing, without a fly-wheel, there is no backlash wheels. It can be fixed on the beams of a floor, or on a slight tion; and, although the speed of the piston (*i. e.* of the disc is only 200 feet per minute, the engine makes three times as evolutions per minute as a common engine; and consequently, t cases, much expensive gearing is dispensed with. It appears bly adapted for driving the screw propeller direct, as the engine as only to be extended through the vessel, and have the pro- fixed to it: it would thus enable sailing vessels, which cannot nuch room, to adopt the screw as auxiliary power.

INVENTION FOR STOPPING STEAM-ENGINES.

the working of this simple piece of machinery, a Steam-engine horse power may be stopped almost instantaneously; by opening that admits the atmospheric air, which instantly chokes the ser of the engine, shuts off the throttle and water valves, and the blow valves. The instant this is done, the fly-wheel only one revolution and a quarter. In the ordinary manner of ng the engine, the fly-wheel makes five revolutions before it can ught to a stand. So complete is this simple piece of mechanism though the whole machinery throughout the mill is stopped, ly, not a single thread is broken, but all remains ready for re- g work when the engine is again set in motion. This piece of nery, which we may term a safety-valve, may be placed in any of the mill or on any part of the premises, or even off the pre- and by the means of pipes it can be made to have the same as if within a yard of the engine itself; so that if an accident n, such as an overlooker or other person being caught with one

* e *Times* new *Printing Machine*, constructed by Mr. Applegath, is bed *in the Year-book of Facts*, 1849, page 6.

of the mill straps and drawn up to go round the shaft, by mode of stopping the engine, before he could by any possi in contact with the shaft, the whole machinery would be br stand-still, and his life saved. This useful discovery is th of James Mills, of Horton, the engine tender at the mill is now in operation: it reflects the highest credit on his i a hard-working mechanic. A patent has been sealed fo names of Mr. G. E. Donisthorpe and James Mills: Mr. I carrying the invention out more fully,—viz., to high-press water-wheels, &c. The expense of fixing the machinery in with the invention in manufactories will be about 10s. power.

PORTABLE STEAM-ENGINES.

THE *Scottish Agricultural Journal* describes a Farm S at work near Edinburgh. It is of four-horse power, a six-horse thrashing mill. In length it is 8 feet, includi boiler, smoke-box, and carriage, which latter is constructe bound with iron-work, and placed on iron axles and whee carriage working on an axle, so as to admit of its being ea The breadth over the axles is 6 feet, and the height to th driving-wheel 8 feet. The height of the chimney is 1 when the engine is not at work, it is lowered by a join from its summit, into "a saddle." The boiler is tubul be easily repaired, and the smoke-box removed, so as to c soot of the chimney and the tubes: means are used to issue of sparks from the chimney. The driving wheel feet in diameter. One of the boiler tubes is made of than the others, so that, in the event of neglect or stupi loading the boiler, this tube will give way and extinguish preventing the chance of explosion. The engine, it is sai the work generally executed by manual or beast power steading: it may be employed in pumping water, mak sawing wood; and being "a moveable subject," it ca alienated, or disposed of" at pleasure, or used jointly by farmers.

A STEAM STONE-DRILL.

MR. JOSEPH J. COUCH, of Boston, has invented a which, it is said, can be worked so as to apply the force with the requisite rotatory motion, and to do the work of to eighty hands at once by the aid of two. The *Atlas* it, says—"The drill is attached to a shaft by means of a s shaft is made to ply with great force by simple mechanism *drill approaches*, the rock is detached as by throwing b *more forcibly*. At every blow a rotatory motion is effec *of a small* ratchet on the drill shaft. In horizontal *power depends* on the momentum of the drill shaft; *inclined positions*, the momentum is assisted by gravi

he machine was placed in a *horizontal* position, and perforated a block of the hardest granite with a 4-inch drill at an average rate of 12 inches in the hour; with a 3-inch drill it executed from 25 to 30 inches in the hour. A medium rate is 125 blows per minute. But by heightening the speed, not only is the number, but the force of the blows increased. The machine can be seen at Mr. J. W. Fowle's, No. 16, East Orange-street."

A similar machine, but worked by hand or by horse, with a crank and fly-wheel, has been invented, or improved rather, by Mr. E. Nicholson, of Newcastle. It appears, however, to be only capable of drilling vertically. The drill is made to rotate also, and to be detached in falling and griped in lifting. With large drills, four men, or a horse, will thus cut a 4-inch hole in hard stone, it is said, at the rate of 2½ to 3½ feet an hour, and two men, with smaller machines, a 4-inch hole in free-stone, at the rate of 5 to 6 feet an hour.

STEAM LOCOMOTIVE FOR COMMON ROADS.

THIS Locomotive, on the high-pressure condensing principle, is stated, in the *Mining Journal*, to be the invention of a needy man in Tavistock. The engine is of nine-horse power; while in proportion it is the lightest ever made, weighing altogether about 30 cwt., consequently not much heavier than an omnibus. The boiler is on an entirely new construction, and weighs 8 cwt. There are two cylinders, inches in diameter; and the great advantage in its light weight is obtained by the use of an entirely new condensing apparatus, without which our informant believes no locomotive can succeed on common roads, in consequence of its own weight. By this apparatus, which consists of a great number of small tubes, arranged in various directions, the steam will be completely condensed to a vacuum; by this it is calculated that there is a gain of 28 lbs. on the inch, at a speed of only 15 miles per hour, above the power of the locomotive now in use, and the principle can be applied to every description of engine. The advantages claimed by the inventor, in securing a patent, are as follow:—A saving of 50 per cent. in the fuel of railway locomotives; no tender required; and, consequently, the propelling its weight, and fifty tons of water avoided; returning the condensed steam to the boiler without taking power from the engine; the enormous resistance of the atmosphere acting on the steam passing off the funnel when at high velocities avoided; expense of water-stations saved, the boiler once filled lasting some hundreds of miles; greater safety; the disagreeable puffing noise done away with; boilers will not corrode so soon, and, consequently, not require so often repairing. For marine purposes, the advantages are great. With hogsheads of pure water, a steam-vessel could cross the Atlantic, avoiding the use of salt water, so injurious to boilers; all the stowage of fuel *saved for more passengers* or freight: smaller engines, in all *cases, will do the same work.* In stationary engines for mines, &c., *per cent. will be saved in fuel*, and more work accomplished—the *use of pumps for raising* condensed water saved. In mines, the

same sized engine will admit of the shaft being sunk deeper under the adit, in consequence of so much condensing water being required to be lifted from the adit with the present engines. Mines where engines are required can be worked at much less cost.

STEAM v. ICE.

Captain Sir James Ross, in his official report of the proceedings of H.M. ships *Enterprise* and *Investigator*, in their late fruitless search after Sir John Franklin's Expedition, says:—"I had much satisfaction to find how perfectly our steam launch fulfilled our expectations in an experimental cruise about the harbour (Leopold) before proceeding in her to the westward in search of a harbour for the *Enterprise*, as it was now beyond probability, from the early setting in of winter, and from the unbroken state of the ice, to reach Melville Island this season. The pack at the harbour's mouth, however, still prevented our immediate departure, and all our energies were devoted to landing a good supply of provisions upon Whaler Point. In this service, the steam launch proved of infinite value, conveying a large cargo herself, and towing two deeply-laden cutters, at the rate of four or five knots, through the sheet of ice which now covered the harbour; and which no boat, unaided by steam, could have penetrated beyond her own length."

DRAINING THE MINES OF SIERRA-MORENA.

An English Company have leased the celebrated Silver Mines of Guadalcanal, in Seville, in Spain, which have been under water for a period of 150 years. Before that time they produced to the Spanish government £100,000 per annum in duties alone; and from the proceeds of these, the palace of the Escurial was built. They were the property of the Fuchars, rich contractors; who, not satisfied with the enormous wealth they derived from them, secretly took away the ores from a new lode they discovered without giving notice to the Government; to prevent imprisonment and confiscation, they let the water into the mine: and for 150 years they have remained in the state in which they were thus left by them. The property is rented by the English Company on the most advantageous terms; and a capital of £10,000 has been raised among a few English adventurers in order to work them. Mr. Nicholas Harvey, of Hayle, who drained the lake of Haarlem in Holland, is one of the the company; and an engine of great power having been obtained, and transported under the direction of Captain Mitchell, this and the engineer, to the mine, Mr. Duncan Shaw, bid fair soon to drain the 120 fathoms, and discover its hidden wealth once more. From advices received since the publication of the foregoing account, the engine has drained the mine in one month to the thirty-one fathoms level.

BARRELS MADE BY STEAM.

It was considered quite a triumph of genius when the first single

achine made its appearance, by means of which a stump, being rown into the hopper, came out transformed into neatly made ingles. But this is a slight wonder compared with the rrel-making machinery of Messrs. Humphrey and Dodge, now in eration at Williamstown, in the State of New York. Here they rn whole trees into flour-barrels, hooped and bunged, with astonish-g rapidity; completing upwards of five hundred barrels per day, all autifully and substantially finished. Each stave, says the *Scientific merican*, takes, in the process of manufacturing, the same position occupies in the barrel when set up; consequently, all the barrels ust be precisely alike. All the staves are of the same width, and, ter they have been seasoned, are placed through the finishing achine, where they are planed, joined, creased, and chamfered. he planing gives the barrel a beautiful appearance; the croze is milar to the croze for tight work, and the chime is left thick and rong. The barrel varies in shape from the article now in use, and supposed to have many advantages on that account. It is about ½ inches shorter, and has an 18 inch head, with the same sized bilge other barrels. On account of their size, one-fifteenth is gained in orage, and, at the same time, the barrel being fuller in the quarter, ill allow 199 lbs. of flour to be packed looser than in the present ape. The heading is also passed through machinery, which gives the same accuracy as the staves. Oswego affords the largest market r flour-barrels in the world; requiring for its own use at least a illion of barrels per annum, beside the ordinary Canadian demand, d the demand for other lake ports on the American side.

CARBONIC ACID GAS ENGINES.

In lately recommending Baron Von Rathen to try the condensation Carbonic Acid Gas in his locomotive air-bottles, generating it from ch carbonates of lime as marble or chalk, we scarcely expected to ar so shortly of a definite invention for the very purpose. Such is e case, however; and it is proposed, in order to cheapen the pro-ss, and render it all the more likely to be economically practicable, at the condensed or liquified carbonic gas, after the expenditure of s power in expulsion from the air-bottles or reservoirs, should be absorbed by quicklime, so as to be as ready for reagency with the lp of sulphuric acid and the air-bottles, as ever; leaving sulphate of me as a marketable residuum. It is calculated that, as a mere ixiliary, a steam-engine of 50-horse power, by aid of such a carbonic id engine, would be equivalent to one of 95-horse power; and that, om the saving of fuel, both marine and locomotive engines could be orked with it to great advantage.—*Builder*, No. 331.

NEW SUSPENSION-BRIDGE AT CHESTER.

Messrs. M'Kean, Perkes, and Co., have designed and executed is novel Bridge. The means by which it is suspended are so com-etely hidden from the public view, that the casual observer would be a *loss to know how it really* was supported. It is one hundred and

fifty feet between the bearings, or points of suspension. The platform, which is seven feet wide, is supported on twelve round iron chain rods, in lengths of fifteen feet each, with very secure joints placed alternately, and running the whole length of the same. These chain rods are secured together by means of transverse flat bars placed at intervals of about six feet apart; upon which the timber platform rests, and is secured to the same by means of T headed bolts and nuts running through the whole, and screwed firmly together underneath. The chains are made perfectly fast at one end to a huge stone pier, built in the embankment. The centre of the pier at the other end of the bridge is formed into a large pit; upon the top of this is secured a very strong turn barrel, around which the whole of the chains take one wind and descend into the pit, and are secured to a strong cast-iron plate suspended near the bottom, at a depth of thirty feet; upon this is built a heavy mass of masonry, forming a weight which completely counterbalances the whole, thereby providing for every degree of deflection, contraction, and expansion. It is also further secured by very strong back stays at each end of the bridge, running a considerable distance inland at a great depth under ground, and firmly bolted to heavy blocks of hard oak; thereby having a resisting pressure of many hundred tons of earthwork, independent of the massive stone piers upon which it rests. It is erected on the estate of Earl Howe, close to the magnificent Grosvenor Bridge, over the River Dee.

SUSPENSION-BRIDGE OVER THE DNEIPER.

Mr. James, of Stamford Street, has recently constructed a model of the Suspension-Bridge which is about to be constructed for the Emperor of Russia over the Dneiper, at Kieff, and which will be half a mile long. It will have six bays, four of them 444 feet long, and two 222 feet. The roadway will be 34 feet wide, and the footpath 6 feet. A swivel bridge, on the Russian side, will communicate with the rest of the structure by an island formed of masonry, and be constructed so that any injury to the chains fastened within it can be easily rectified. The whole work will occupy about five years in completion. The model, prepared in London for the Emperor, is constructed on the scale of one-eighth of an inch to the foot.

SUSPENSION-BRIDGE AT PESTH.

The Suspension-Bridge over the Danube at Pesth was commenced in 1840, according to the designs, and under the direction of, William Tierney Clark, civil engineer; and has just been completed at a cost of £650,000. This bridge, which, for magnitude of design, and beauty of proportion, stands first among supension-bridges, has a clear waterway of 1,250 feet, the centre span or opening being 670 feet; the height of the suspension-towers, from the foundation is 200 feet, being founded in 50 feet of water. The sectional area of the suspending chains is 520 square inches of wrought iron, and the total weight of the same 1,300 tons. This is the first permanent bridge,

e time of the Romans, which has been erected over the Danube Vienna; it having been considered impossible to fix the foun- in so rapid a river, subject to very extensive floods, and to the enormous force of the ice in the winter season. It wever, stands as another monument of the skill and perse- of our countrymen. The bridge was opened for the first t to an ordinary public, but to a retreating army, on the 5th ary, 1849, by which the stability of the structure was put to t severe test. This cannot be better described than by re- to the letter of a correspondent, who writes:—"First came ngarians in full retreat, and in the greatest disorder, hotly by the victorious Imperialists; squadrons of cavalry and in full gallop, backed by thousands of infantry—in fact, le platform one mass of moving soldiers; and during the first s 60,000 Imperial troops, with 270 pieces of cannon, passed e bridge." This evidence is of great importance to the world; since it proves that suspension-bridges, when pro- nstructed and trussed according to the design of Mr. Clark, erected in the most exposed places; while their cost, in com- with stone bridges, is comparatively insignificant.—*Times.*

BRIDGE BUILT IN A WEEK.

erection of a large Railway Bridge, 75 feet 6 inches long, and high, in a week, may be regarded by some as an impossibility; he feat has been all but accomplished on the Leeds and Thirsk . Messrs. Gerside and Parker, sub-contractors, laid the ion of a bridge of the dimensions specified, behind the Retreat, ey, near Leeds, on Monday, June 25th; on the evening of wing day the abutments were raised to the springing, and the laced for supporting the stones of the arch during its construc- On the Wednesday evening, the key-stones were fixed. On owing Friday, the masonry on both sides was raised to the the cornice; and on the next day a roadway was made across lge, which would have been completed but for some delay upply of stone for the parapet wall.

FULLER'S LOGARITHMIC SCALE.

FULLER, of Boston, U.S., has introduced into this country a Sliding-Rule, eight inches in diameter; it therefore answers oden rule of twenty-five inches long in scale. The material ing but pasteboard, in which is a circular excavation, into s let a circular pasteboard plate which just fills it. The fixed ard and the revolving one have each a logarithmic scale pasted that by the revolution of the plate, any division of the inner ter scale may be made to coincide. The work is beautiful; scale is really an effective one of its size. When both scales to coincide throughout, there is no appearance of warping pasting anywhere; and the consonance of the divisions, in

all cases, furnishes a strong illustration of the truth of Euclid's remark, that a straight line may be produced in a straight line.

A similar scale on the other side of the pasteboard basis, having an independent plate turning on the same axis as the logarithmic one, has a rule for passing from one day of the month to another by the number of days, &c.

The paper scale has one great advantage over the wooden one. Readings may be printed upon it to an extent which would be impracticable upon the wood. This is the case in Mr. Fuller's instrument, and the consequence is that the second and third figures of the result come off with very great ease.

Many commercial gauge points are inserted; indeed, Mr. Fuller's object seems to be the attraction of commercial patronage. The commercial calculator neglects the sliding-rule. To be sure, our subdivision of the pound is against it; and a great many calculators of shillings, pence, and farthings are not aware that the reduction of the silver and copper to decimals of a pound can be done in the head, after half an hour's practice. Mr. Fuller states that he has had a large sale in America, where the division of the dollar is decimal. The end of it will be, that our United States brethren will establish logarithmic calculation in commercial matters. We might do the same either by a decimal coinage, or by the very easy rule which turns our secondary coins into decimals of a pound. Without at all implying that Mr. Fuller's apparatus is only to be recommended for commercial purposes, we feel inclined to press it upon men of business, as those who might be most benefitted by a handy implement, which might hang against the wall of a counting-house, and would not only give something more than a rough answer to very extensive classes of questions on demand, but would check the leading figures of elaborate computations.—*Mechanics' Magazine*, No. 1330.

NEW SURVEYING INSTRUMENT.

THE *Journal of the Franklin Institute* gives a report of the Committee on Science and the Arts, on an Instrument likely to be very useful to Railway Surveyors and others. The invention is intended to give the distances between the stations by means of a single observation through the instrument, without the necessity of using a chain, or any other measuring apparatus. The committee report favourably of it. The principle is by a divided lens at the inner end of the eye-piece of a telescope, equally inclined to a vertical plane on opposite sides, perpendicular to the axis of the telescope. The tube containing it is also divided throughout by a vertical partition or diaphragm. The distance is measured by means of the coincidence of double images of vanes on a graduate staff, set up at a given distance. *Mr. Vileroli* is the inventor.

NEW CALCULATING INSTRUMENTS.

THESE Machines have been exhibited to the British Association by *Mr. H. Knight*. The inventor is a Mr. Slonimski, of Byalystock,

'oland. The first instrument submitted was one for performing the rithmetical processes of addition and of subtraction. It consists of thin box of wood or metal, covered by a plate of metal, in which re perforated a convenient number of circular apertures and openings; round which are engraved or marked the several figures or digits to 9, and behind which are indented plates or wheels, having in each suitable number of teeth, some of which are shaded, or black, the thers being left clear, or white. A small pointer, or style, is furished with the instrument, for the purpose of turning round the ndented plates or wheels, by inserting the instrument between two ontiguous teeth, and moving it in the required direction. The style required to be inserted between those two teeth which appear under e particular figure engraved on the plate, which corresponds with e number required to be added or subtracted. One general rule ust be attended to, viz., that if the style be placed between two lear or white teeth, it must be turned to the extreme right hand of e circular opening; but if between two dark teeth, it must be turned the extreme left hand end thereof. The upper part of the instruent is to be used for addition, and the lower part for subtraction, as ngraved thereon. The multiplication instrument consists of a rectngular box, about fifteen inches square, and three inches deep. It ontains cylinders having printed tables of figures on the circumerence of each, which cylinders revolve separately, by means of the nobs at the bottom of the box; and by other knobs, the upper part f each cylinder is moveable in a vertical direction also—the rotative nd the vertical motions being regulated by figures termed indices, hat appear through small holes over the axes of the cylinders. In ddition to the index holes, there are nine other rows of holes on the urface-plate of the instrument—the lower row of holes being for the nultiplicand, and the corresponding rows of holes above it to exhibit he products of that multiplicand by each of the nine digits; these roducts being produced almost immediately, and without requiring ny mental effort. The horizontal number of holes in this instrument eight; and it is therefore calculated to give the product of any umber having seven places of figures, or to millions, whatever may e the order of those figures. The machine is the result of a new heorem of figures discovered by Mr. Slonimski.

After Mr. Knight had exhibited his models, several gentlemen xpressed an opinion that an instrument of a similar character had lready been noticed in the columns of the *Athenæum*. Mr. Knight, however, declared that the one alluded to was of a very different character. —*Athenæum*, No. 1143.

In reference to a Calculating Machine lately invented by Messrs. Maurin and Jaray, in France, a series of previous inventors have been enumerated; but amongst the number we do not find the name of a *celebrated individual, well* known during his life-time at Warsaw. *Stern, a Polish Jew, invented* a machine, of which he had a model, *d which he gradually brought* to such a state of perfection that it *t only worked out the first four* books of arithmetic, and the Rule

of Three, but extracted the square roots, showed the fractions completely reduced, and gave all the logarithmic calculations. With a key the figures of a problem were set; and afterwards, by turning a small crank, in a few seconds, or, if the proposition was very long and complicated, in one or two minutes, the product was obtained, which would have been arduous to the most accomplished arithmetician. It was very simple, and its mechanism easy of explanation. The principal model did not exceed a foot in length, and could be reduced to the size of a pocket machine. It could also be set at work without the aid of the crank itself. The death of the inventor, and subsequent events, prevented this machine from being put into practice.

MINING CASUALTIES.

It has long been a desideratum in Mining to provide against the breakage of ropes and chains; for not only do such occurrences destroy life, but in shafts which are fitted up with guides according to the best modern practice, great danger is occasioned to the shaft-fittings; therefore, in the absence of any expedient to provide for such events, the ropes and chains are withdrawn as worn out long before they otherwise would be. Mr. Fourdrinier has invented the means of fixing the cage and tubs instantaneously to the guides by means of self-acting springs, levers, and wedges, attached to the top, and forming part of the cage, which come into action when disengaged from the rope or chain. A constant source of danger likewise prevails on the drawing of the load up against the pulleys, which is also attended with certain death as well as damage to the property. This casualty Mr. Fourdrinier also removes by attaching to the chain a disengaging apparatus, such as that made use of in the pile-driving machine, the cage being at the moment of disengagement left affixed to the guides at a certain distance below the pulleys. The invention may, therefore, be said to provide entirely against the breakage, or the drawing up against or over the pulleys, whilst it produces an economic effect in the following particulars, namely:—With confidence in this invention, the ropes may be worn considerably longer than safety would otherwise warrant; and they are especially benefited by the cage arrangement, inasmuch as the load is lifted in two progressive stages, rather than as at present in one abrupt lift, thus doing away with the violent sudden jerk which acts so detrimentally to the machinery. Such is the general description of this invention; but as many fancied improvements in mining matters are discovered, after practical experiments, to fall short of the utility attached to them by their inventor, a day was appointed to witness a trial of the apparatus, which had been in current operation since the 16th of April at Usworth Colliery, Durham. The shaft is ten and a half feet in diameter, and is fitted up with wooden guides, being five inches by three inches, and within which a pair of cages are made to work, being seven feet eight inches; within the guides, and each cage containing two tubs carrying ten cwt. of coals; so that the weight of the whole moving load may be stated as follows,

ıely :—Cage, with lifting chains and apparatus, 22 cwt. ; two tubs, wt. ; coals, 20 cwt. ; in all, 48 cwt. The experiment was made suddenly destroying the rope which suspended this weight, when apparatus instantly took effect, and the whole was firmly affixed to guides. The experiment was repeated several times with success. *Newcastle Journal.*

VENTILATION OF COAL MINES.

MR. JOHN MARTIN, K.L., of Lindsey House, Chelsea, states as : result of long inquiries and many experiments, his conviction that : only preventive of Coal Mine Explosion is in such a thorough stem of ventilation as would render it safe to use common candles, gas lamps, to light the workmen—which advantage Mr. Martin ıtes the following plan to insure, together with efficient drainage, d greater economy. Assuming the field of coal to be unworked, r. Martin proposes to form a parallelogram, or a square of any size, y half a mile on each side, or two miles round the whole mine, as llows :—From the bottom of the down-cast shaft two ways should be rmed running close by each other, the one to go, and the other to turn, till the first half is attained ; these ways should then turn at a ght angle to the left for another half mile to the up-shaft ; this ıould be repeated on the left hand of the down shaft, completing the uare, and obtaining a free current round the whole mine, from the wn to the up-shafts on the right, and the same on the left. To cilitate the working of this mine, the two shafts should be commenced at the same time, and the ways would thus meet each other ; the intermediate angles ; after which the coal should be cut away om the corners between the shafts, care being taken *never to enter ie main body of the coal.* In some places it would be necessary to ork by means of two and perhaps three rows of pillars, but the whole f the coal should ultimately be removed, excepting the row of pillars ext to the surrounding gallery or outside way, which will be of value ı protecting the drain, and likewise in working the next square mine hen the first is exhausted. Gunpowder might safely be used in this lan, as the current of fresh air would continue to sweep the face of ıe works ; and as fast as the gas discharges, it will be carried away by ıe ventilator of the up-shaft. As the open space behind the works ecomes wider, the support being removed, the roof will fall in, and lose up the void ; but it would be of no consequence if this were not ntirely closed up, since the higher end of the goaf would always be earest to the ventilating gallery ; the hydrogen gas escaping by a hort and straight line to the up shaft, and the water and carbonic cid gas running off by means of his patent tube drain to the well at he down-shaft, and thence pumped out. Thus would be obtained he shortest, simplest, and straightest way to ventilate, drain, and arry off the coal, without danger to life from explosion, or chokelamp, or chance of destruction of property ; without trap-doors or nen to watch them ; without the necessity for inducing men to work y *means of a pretended safety* lamp ; and last, and of no small im-

portance to the coal-owners, without viewers paid a heavy centage for working dangerous parts of the mine. Wherever a new mine is to be opened, it should be upon this principle; though it is not absolutely necessary to form an entirely new mine for the purpose, as the plan can be applied at once to an old one without any practical difficulty. Thus (adds Mr. Martin) I would substitute for the present complicated labyrinths, the numerous recesses and immense goafs in which retard and prevent the escape of foul air (to say nothing of the imperfect boardings, stoppings, and trap-doors, and similar costly machinery), a simple, comprehensive, and economical system, which affords one mile of perfect safety and free circulation of air; instead of one hundred miles of intricate labyrinths, containing every horror and danger of explosion and suffocation.

PREVENTION OF EXPLOSION AND FIRE IN COAL MINES.

In April last, the Astley Colliery, in the neighbourhood of Manchester, having taken fire, Mr. Darlington, the proprietor, applied to Mr. Goldsworth Gurney, to extinguish the conflagration. Mr. Gurney replied, that he had no doubt carbonic acid gas could be driven through the mine so as to extinguish the fire. Mr. Darlington acted upon the opinion of Mr. Gurney, and has since acquainted the public that the fire was extinguished at a cost of fewer pence than there would have been pounds, had the old system of pumping in, and of pumping out, been adopted.

The following is Mr. Darlington's own account of the experiment:—

"On Monday morning, April 2, one of my coal mines at Astley was discovered to be on fire, and had spread to such an alarming extent as to prevent all access by the usual shafts. We immediately put out all the fires about the works, and requested the cottagers in the neighbourhood to do the same, for fear of an explosion. The plan of procedure in such cases (which happen more frequently than those unacquainted with collieries suppose) is, first to stop down all openings into the mine, so as to prevent any access to the atmosphere. If, after some time, the fire is found not extinguished, the only alternative is to fill the mine with water from some source in the neighbourhood. In the absence of a sufficient reservoir of water, the pumps are stopped, and the water allow d to accumulate from the natural drainings, generally an unsatisfactory and slow process. In the former plan, notwithstanding every precaution is taken in sealing the shafts, it is found by experience that air in small quantities will be drawn through the stoppings and fissures of the earth sufficient to keep up a slow rate of combustion for a very long period. We have proof of this in many cases occurring in this neighbourhood. In the extensive collieries worked by Lord Bradford, at Bolton, the mine has been on fire nearly two years. When the fire happened it was sealed up for some months; but, on opening it, the fire was still found burning. The pits were again immediately sealed up, and left to remain for twice the former period. On opening the mine at this time, the fire burst out as before. It was again closed, and so remains to this da

ries of the Earl of Ellesmere, at Worsley, one of the mines
ut the same time; it was treated in the same way; it
re; and, at this moment, his Lordship is about to turn
gewater Canal. In the Patricroft Colliery, the deepest
county, a fire broke out in the upper part of the work-
affled every attempt to extinguish it, and is now stopped
doned. At Mr. Blundell's colliery, at Blackrod, in this
pits were opened after being closed some weeks, on ac-
, when a fearful explosion took place, and did considerable
he workings. The fire burned with greater intensity than
imes rose out of the mines, and set fire to the head-gear,
so fiercely within the pit, that it actually melted the iron
. In this case the river Douglas was eventually turned
kings so as to fill them with water. I could mention
cases in this immediate neighbourhood to show the im-
the question before us, and the difficulties we have to
n when these unfortunate accidents occur. In our case we
led up the mine, yet fire-damp issued from every crevice
stoppings, and through orifices in the earth, in such
at the safety lamps would take fire at a considerable dis-

e of things, I wrote to Mr. Goldsworthy Gurney, whose ap-
high-pressure steam to the ventilation of coal mines is ex-
ch interest, stating the case, and asking if he could point
n by high pressure steam exhaustion, or otherwise, likely
ice. Mr. Gurney immediately came down, and after well
; the conditions, in consultation with us, proposed to fill
th carbonic acid, azote, or some other extinguishing and
le gas. This, at first, appeared to us impracticable, and the
antity required to fill the galleries and lateral workings,
ove three miles in length, too expensive, if it were possible
, to warrant the proposition. He, however, soon set us
said nitrogen or azote might be obtained from the winds of
carbonic acid from the coals lying waste about the pit,
a little charcoal and lime; air would be deprived of its
being passed through burning charcoal, coke, and small
e azote set free. In short, the product of this combustion
e choke or black damp known in mines. We immediately
ce of brickwork, four feet square, at a safe distance from
st shaft. To the ash-pit, in every other respect made
n cylinder thirteen inches in diameter was connected, and
minate at an elbow under water in a close tank partly
h the upper part of this tank, above water, another pipe
ed and carried through the stopping of the downcast pit.
steam jet was made to work between the face and the
drew the air down through the fire, and forced it through
A second jet was placed in the cylinder at the top of the
ft, and made to draw the choke damp from the tank, and
he pit. At the other, or upcast shaft, we placed a jet in

a cylinder through the stopping, and made to exhaust from the : beneath, so as to assist the compressing jets, and draw the choke d through the galleries between them. The apparatus thus fitte soon as the fire had burnt up, was set in action. In order to tes effect of the choke damp, we placed some burning tow, moist with spirits of turpentine, into it. The flame was as instantly e: guished as if placed in water. It was thus tested in the cylinde it passed from the ash-pit, before coming to the jet; also in the and second cylinder, with similar results. This was conclusive dence of the perfect formation of the choke damp.

In about two hours after, the jets were set in action, fire damp appeared from the shafts, and we observed a slight cloudy appear in the escapage from the upcast shaft. It had the sulphurous s of choke damp, which pervaded the air to a considerable distance. safety lamp was now brought and placed in the upcast cylinder; i came instantly extinguished as if put in water. For this purpos draughts were momentarily shut off. A bright burning fire of c coal, in a chafing dish, was placed in the escapage of the cylinder, was also immediately extinguished. These facts satisfied us tha choke damp had passed through the mine. The period of its app ance agreed with our calculations. The quantity of choke damp fc through the mine was about 6000 cubic feet per minute, and would fill the galleries in about that time. The choke damp wa lowed to remain for several hours, at the termination of whicl were convinced that all fire, however intense, must be extinguish the mine. The connection with the furnace was now broken, fresh air driven through by the same jets. In about two hour choke damp disappeared; this was shown by a safety lamp bur clearly in the escapage, in the cylinder at the upcast shaft. W garded the mine now as perfectly safe. With several men I desce the downcast shaft, 390 feet deep, to the tunnel leading to the w ing. We found all clear. The exhausting jet was kept up, dra fresh air through the mine all night. The next day several men down and passed through the workings, and found all clear and Their report was particularly favourable. In no part of the could they perceive any fire, and the action of the single jet in th cast is described by them as passing a current with greater speed the furnace (which is pronounced to be the most effectual one i county) had ever before done in this or any of the other min which I am the proprietor. This result has occasioned the gre interest in our neighbourhood.

Never was an experiment more successful. A gigantic power u such complete control, fighting with the elements, and, as it compelling them to destroy each other. The application of l pressure steam to the ventilation of coal mines may effect a gr protection to life and property; but we regard this applicatic little inferior to the coal trade, and a triumph of science equal t *of the present day.* The steam jet is now used to ventilate the n *the galleries are perfectly* clear, and the men are working with

candles. In all the progressive stages of coal mining—but more particularly of the present time—when we find that by the ingenuity of scientific developments it has become one of the most prodigal sources of wealth, not only to the capitalist, but to the labouring artizan, the uncertain value of mineral property has invariably thwarted and repulsed the enterprise of the nation. To-day we may have a remunetive adventure, watched over by the genius of revealed theory and practice; while to-morrow may discover it has become the element of wholesale destruction to life, or a wreck of private hazard and national wealth. This experiment goes far to remove the impending danger, and render those difficulties which hitherto have been insuperable, easy to be overcome, and at so trifling a cost as to be within the reach of the smallest capitalist.. The simplicity of the experiment is only exceeded by its novelty; and the success is, unquestionably, the most perfect that any single demonstration could possibly have produced. The advantages are more numerous than we can here detail. Supposing an ordinary fire requires the shafts to be sealed for two months; what is the proprietor to do in the meantime, if he cannot reduce the fire to a given space in the mine? His connections in trade, if not entirely lost, are restricted and broken; his mine injured and consumed, and the working colliers left to starve out the interim. His annual rents, interest of capital, and the more serious disbursements of incidental expenses, fall heavily upon him; whereas, the immediate application of our experiment would put the mine in a working condition, with a delay of not more than two days. These facts are brought before the public for the benefit of all classes, being a public remedy for a national loss. To the untiring energy of Mr. Gurney are we indebted for them. He voluntarily tendered his services, and, owing to his ability, the mineral property of this kingdom has been insured against the destructive element of fire, and consequently made a safer investment for capital. The expense of this experiment was trifling compared to the inconvenience, delay, and cost of letting in water to fill the mine, and pump it out again, being not more than as many pence as the other would have been pounds."

IMPROVEMENT IN THE DAVY SAFETY LAMP.

The Rev. W. Thorp, of Womersley, in the West Riding of Yorkshire, is the originator of this useful improvement, which is calculated to remedy the defects in the lamp of Sir H. Davy; affording very much greater light, and being uniformly safe, under different conditions of the coal mine.

The two great defects in the Davy lamp, now generally in use, are —first, that it affords too little light; and hence the miners often work with a candle in danger, and do not use the lamp: secondly, the Davy lamp in certain circumstances is not safe; indeed, the Miners' Association of Newcastle have published "An Exposition of the Insecure Nature of the Davy Lamp, and other Lamps, as applied to Coal Mining; taken *from the* Parliamentary Report for 1835."

In *order to obtain more light*, the Rev. W. Thorp introduces, with

considerable ingenuity, the argand, or solar burner, characterise(the circular wick, and air admitted through its centre, from bottom of the lamp, and guarded by meshes of gauze wire. (nected with this part of the lamp is an adjustment, placed outsic the cistern, by which the wick can be raised or lowered with greatest ease. Over the light is applied an iron chimney, based glass, but which is so securely fixed that it cannot be broken from ordinary falls or other minor casualties to which these lamps usually exposed.

Having obtained the great desideratum, viz. rather more than times the quantity of light afforded in the Davy lamp, or that al equal to two candles, the next object is to insure perfect safety; this is accomplished in the following manner:—An iron chim based by a few inches of glass, is introduced into four or five ch bers of gauze wire, through which it is utterly impossible, by any ficial means, as jets and currents, thrown upon them, to pass through in a state of ignition; and thus, under the severest artii tests to which it can be applied, the lamp is proved perfectly completely safe. The other advantages in this lamp are as follow: 1. It requires trimming only once a week. 2. The oil does no out if laid on one side. 3. It is much more easily cleaned. ‹ burns the cheapest oil.

The price of the lamp will not be more than three or four shil above the Davy lamp; and at about five shillings expense the can be converted into the new lamp. A cast metal cistern, in of a bras sone, would reduce the price of the new lamp to less the present price of the Davy.

PREVENTION OF COAL-PIT EXPLOSIONS.

Dr. George Dunn, of Doncaster, has invented a venti by means of which it appears from experiment at the I Main Colliery, where it has been tested, that such a perfectl circulation is attainable through a pit as will obviate all cha explosion. This ventilator, says Mr. Dunn, may be construc wood, zinc, tin, iron, or copper. One is to be placed in the f(a hood or cowl, and self-acting, over the upcast shaft; while ano to be placed over the downcast shaft, with its open side or mo the wind, and will also be self-acting, where a downcast shaft appropriated to it: by these means a current of air is to be m circulate through every part of a mine.

DR. ARNOTT'S VENTILATING CHIMNEY-VALVE.

In a late notification from the Board of Health respecting C the following passage occurs, after the d scription of an ill-ven dwelling:—"Under such circumstances, considerable and imn *relief may* be given by a plan suggested by Dr. Arnott, of ta *brick out of* the wall near the ceiling of the room, so as to *direct* communication between the room and the chimney. *casional tem*porary inconvenience of down-draught will be

compensated by the beneficial results of this simple ventilating process." Respecting the contrivance and the *rationale* of its action, Dr. Arnott has addressed a letter to the *Times;* in which, after illustrating, in various ways, the efficacy of ventilation or dilution with fresh air in rendering quite harmless any aërial poison, the Doctor proceeds to explain that every chimney in a house is what is called a sucking or drawing air-pump, of a certain force, and can easily be rendered a valuable ventilating-pump. "A chimney is a pump: first, by reason of the suction or approach to a vacuum made at the open top of any tube across which the wind blows directly; and, secondly, because the flue is usually occupied, even when there is no fire, by air somewhat warmer than the external air; and has, therefore, even in a calm day, what is called a chimney draught proportioned to the difference. In England, therefore, of old, when the chimney breast was always made higher than the heads of persons sitting or sleeping in rooms, a room with an open chimney was tolerably well ventilated in the lower part, where the inmates breathed. The modern fashion, however, of very low grates and low chimney openings has changed the case completely; for such openings can draw air only from the bottom of the rooms, where generally the coolest, the last entered, and therefore the purest air, is found; while the hotter air of the breath, of lights, of warm food, and often of subterranean drains, &c., rises and stagnates near the ceilings, and gradually corrupts there. Such heated, impure air, no more tends downwards to escape or dive under the chimney-piece, than oil in an inverted bottle immersed in water will dive down through the water to escape by the bottle's mouth; and such a bottle or other vessel containing oil, and so placed in water with its open mouth downwards, even if left in a running stream, would retain the oil for any length of time. If, however, an opening be made into a chimney flue through the wall near the ceiling of the room, then will all the hot impure air of the room as certainly pass away by that opening as oil from the inverted bottle would instantly all escape upwards, through a small opening made near the elevated bottom of the bottle. A top window-sash, lowered a little, instead of serving, as many people believe it does, like such an opening into the chimney flue, becomes generally, in obedience to the chimney draught, merely an inlet of cold air, which first falls as a cascade to the floor; and then glides towards the chimney, and gradually passes away by this, leaving the hotter impure air of the room nearly untouched.

"For years past, I have recommended the adoption of such ventilating chimney openings as above described, and I devised a balanced metallic valve, to prevent, during the use of fires, the escape of smoke into the room. The advantages of these openings and valves were soon so manifest, that the referees appointed under the Building Act added a clause to their bill allowing the introduction of the valves, and directing how they were to be placed; and they are now in very extensive use. A good illustration of the subject was afforded in St. James's parish, where some quarters are densely inhabited by the families of

Irish labourers. These localities formerly sent an enormous of sick to the neighbouring dispensary. Mr. Toynbee, the ε dical chief of that dispensary, came to consult me respec ventilation of such places; and on my recommendation had made into the chimney flues of the rooms near the ceiling moving a single brick, and placing there a piece of wire gauz light curtain flap hanging against the inside, to prevent the smoke in gusty weather. The decided effect produced at on feelings of the inmates was so remarkable, that there was a sive demand for the new appliance; and, as a consequence of tion, Mr. Toynbee had soon to report, in evidence given b Health of Towns Commission, and in other published dc both an extraordinary reduction of the number of sick app relief and of the severity of diseases occurring. Wide e elsewhere has since obtained similar results. Most of the and poor-houses in the kingdom now have these chimney-va most of the medical men and others who have published c sanitary matters have strongly commended them.

"The chimney-valves are part of a set of means devised ventilation under all circumstances. My report on the ven ships, sent at the request of the Board of Health, has been in the Board's late Report on Quarantine, with testimony to the Admiralty as to its utility in a convict ship with 500 All the new means have been freely offered to the public; bu desiring to use them should be careful to employ competent n

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DR. CHOWNE'S AIR-SYPHON VENTILATOR.

DR. CHOWNE has proposed a new mode of Ventilation, his finding (as stated in the specification of a patent enrolled that, "if a bent tube or hollow passage be fixed with th wards, the legs being of unequal lengths, whether it be in air, or with the shorter leg communicating with a room or ot that the air circulates up the longer leg, and that it enters a down the shorter leg; and that this action is not prevented l the shorter leg hot, whilst the larger leg remains cold; whil ficial heat is necessary to the longer leg of the Air Syphon this action to take place." Thus, by using the chimney of nary room, for example (into which air has free access), as leg, and by conducting a tube or channel constituting the sl the Air Syphon, from any part (as near the ceiling, for into the lower part of the chimney, at the suitable place,—a air will proceed from the apartment down the shorter leg, up the longer one.

The formation of the necessary channels to collect the i of a room, and to convey it down to its point of entranc longer leg, appears to be compatible with the preservation tectural ornament.

* *This new* Ventilating Valve is made by most reputable iron

In assembly-rooms, (even where fire is not used,) which become over-heated and close, to whatever part of the room rout-forms extend, the means of ventilation can also be conducted, either by channels (as light zinc tube) suspended under the forms, or by making the forms themselves hollow channels. In either case, this channel being made continuous, and finally passing through an opening in a chimney-board, or by some similar arrangement, into the fireplace, and tubes passing from these to the upper parts of the room,—the warm air would constantly descend through them to the continuous channel, and then into the larger leg of the syphon.

The Air-syphon Ventilator admits also of being extemporaneously and temporarily set up in a sick-room, so as to cause a constant removal of air from the upper portion of the apartment, where it is so apt to hang about the curtain furniture of the chamber, and to impregnate it with the exhalations which are commonly the result and generators of disease.

A peculiar fact is, that this mode of ventilation affords facilities hitherto not known for carrying away the heat and other products of combustion from gas-burners, and other lamps, of which the products are offensive. Again, wherever the Air-syphon Ventilator is in operation, it is certain, that, should an accidental escape of gas take place, it will not accumulate, but descend from the upper part of the room by means of the shorter leg of the syphon.

It is reasonable to expect that the applications of this discovery will be numerous. Not only in the chamber, and subterraneous works, may it be employed; but in ships, so that the lowest holds, where disease is generated in the close berths of the seamen, may be rendered as fresh as the upper decks. In short, "there is not a sanitary measure suggested to which the syphon may not form a most beneficial adjunct. There is not a hovel, a cellar, a crypt, or a black, close hole anywhere, that it may not cleanse and disinfect."

JUCKES'S SMOKE-CONSUMING APPARATUS.

MESSRS. CHAMBERS, of Edinburgh, having erected a new furnace and chimney for a ten-horse power steam-engine, which moves their printing machinery; with a view to remove all challenge respecting smoke, applied Juckes's patent Smoke-consuming apparatus. This apparatus resembles no other smoke-consumer. It consists of what may be called an endless chain of bars, disposed not cross-wise but lengthwise, and this chain of bars forms the bottom of the furnace, on which the live coal blazes. The chain moves very slowly forward —not more than at the rate of an inch in the minute—from the front to the back of the furnace, carrying the fire along with it. At the back or bridge of the furnace, the chain of bars moves round, and returns beneath. Thus, it goes on endlessly from morning till night. The apparatus is fixed on a carriage, which is run into its place on a species of railroad; and the whole—that is, the whole bottom *of the furnace— can be* dragged in or out at pleasure; by which *means every facility is presented* for cleaning, renovation, &c. The

chain of bars is moved by connecting gear from the s
The coal is laid on a hopper at the mouth of the furnace, a
forward by the bars ; the depth of coal that enters being
an iron door, which is depressed or raised like a sluice.
ciple of smoke-consumption consists in the slow and regul
of the coal. Instead of being heaved in with a shovel,
duce continual gusts of smoke, it is admitted, as it w
breadths. The ignition is therefore little at a time, and
is raised having to go over the whole bright fire beyond
sarily consumed. Nothing gets up the chimney but a
scarcely perceptible to the eye. The apparatus, we are
further advantage of economising fuel and attendance,
tains the steam equally with the common practice of
great beauty of the whole thing, however, is, that the si
sumed. We have seldom seen any process of art more
yet more ingenious and beautiful. It is the first instance
of Juckes's patent being applied in Scotland.—*Scotsman*

We have witnessed a very successful application of Ju
ratus to the furnaces of Price's Candle Company, at Vau

NASMYTH'S FIRE-PROOFING.

MR. J. NASMYTH, of Ebury Street, Pimlico, has pat
improvements in the construction of Fire-proof Flooring
which are also applicable to the construction of Viaducts
and Culverts.

These improvements in floors and roofs consist in
them of iron plates, which are bent into the form of a
circle, or into a conical, polygonal, or other shape, by
plate-bending machinery, or by any other suitable me
bent plates are supported on chord plates, or tension
have their ends bent upwards, whereby the plates are reta
curved position when subjected to pressure. The ends c
rest upon the flanges of cast or wrought-iron girders, abc
cast or riveted knee pieces, which prevent the bent ends
from springing: or, instead of iron plates, angle or T ir
the required shape, and supported upon chords restin
flanges of girders, may be employed. Over these curv
plates are bent, with their ends placed underneath the
of the chords. The spaces above the iron plates are fillec
the flooring, with Portland cement mixed with broken
other suitable materials.

The improved girders are formed by bolting iron plates
and top of stone arches and chords, combined as before
plates are made with flanges to support the arches and c
form the joists, and have also knee pieces bolted to then
the chords from springing when the arch is subjected
The arches and chords may be made of one piece eacl
made of several pieces bolted or riveted together. C

may be caused to pass in the hollow spaces left between the arches and their chords, and through perforations in the floor into the room.

FIRE-PROOF BUILDINGS.

A PAPER has been read to the Institution of Civil Engineers, "On Fire-proof Buildings," by Mr. J. Braidwood. The author analysed the evidence as to the capability exhibited by cast and wrought iron beams for sustaining weights where they were exposed to any extreme changes of temperature. He demonstrated, by a collection of specimens of metal from buildings that had been destroyed by fire, that occasionally the temperature in the conflagration of large buildings rose almost to the melting point of cast iron: and that even in a small fire, beams and columns of cast-iron would be so affected by the heat and the jets of water thrown upon them, that they would probably be destroyed, and sometimes cause a fearful loss of life; as in many of the so-called fire-proof warehouses of the city, a number of persons employed on the premises slept in the upper floors; and if the lower beams gave way, the whole would be dragged down suddenly—whereas timber beams resisted fire some time, and allowed opportunity for the inmates to escape. Another point which the author considered had not been sufficiently insisted on was the derangement of the brickwork by the expansion of the iron beams at high temperature, and its sudden contraction on the application of cold water; likewise from the mortar becoming completely pulverized by the excessive heat, instances of which have been known to occur.

The following were the principles on which Mr. Fairbairn has proposed to construct fire-proof buildings.—1. The whole of the buildings to be composed of incombustible materials, such as iron, stone, or brick. 2. That every opening or crevice communicating with the external atmosphere be kept closed. 3. An isolated stone or iron staircase to be attached to every story, and to be furnished with a line of water-pipes communicating with the mains in the street. 4. The different warehouses to be divided by strong partition walls, and no more openings to be made than are absolutely necessary. 5. That the iron columns, beams, and brick arches be of a strength sufficient not only to support a continuous dead pressure, but also to resist the force of impact to which they are subject. Lastly. That in order to prevent the columns from being melted, a current of cold air be introduced into the hollow of the columns from an arched tunnel under the floors. Mr. Braidwood argued that there could be no doubt, if the second principle could be enforced, a fire would go out of itself; but it was very doubtful if the object was not defeated by carelessness in leaving a door or a window open just at the time when a fire occurred. The fifth principle showed that Mr. Fairbairn had not laid sufficient stress on the loss of strength to the iron consequent on an increase of temperature; and the last principle, it was thought, would not be likely to answer the purpose, as a specimen of 1½ inch cast-iron pipe, *on being heated in* the centre, with both ends open, and a *current of air passing* through it, gave way, one end being held in a

vice, and the other pulled with slight force by the hand, after an ex-posure of only four minutes in the fire. For these reasons and others Mr. Braidwood submitted that large buildings containing considerabl quantities of combustible goods, and constructed on the usual system were not practically fire-proof; and that the only construction whicl would render such buildings safe would be groined brick arches, sup ported by pillars of the same material laid in cement. The autho was also of opinion that the loss by fire would be much reduced i warehouses were built of a more moderate size, and separated fron each other by strong party walls, instead of being constructed i immense ranges, into which when fire had once penetrated it set a defiance all efforts to extinguish it.—*Athenæum*, No. 1144.

FIRE-PROOF CEILINGS OF WIRE-WORK

HAVE been successfully applied, in place of lath, with plaster an stucco as usual, at the Chester Lunatic Asylum. The wires are abou a quarter of an inch apart, and the plaster forms an adhesive an serviceable mass, even on both sides. The wire is galvanized, o japanned, to prevent corrosion. Not only ceilings, one would think but thin partitions and walls in general, might be wired in place o lathed, and risk of fire thus greatly diminished by a process neithe patented nor costly.—*Builder*, No. 350.

HOLLOW BRICK CEILINGS.

A PAPER has been read to the Institution of Civil Engineers, on th Hollow Brick Ceiling recently turned over St. George's Hall, Liver pool, by Mr. Robert Rawlinson. Having stated that it had been th intention of the late Mr. H. L. Elmes, the architect of this building to construct the ceiling with patent compressed bricks, Mr. Rawlinso observed that he in using the hollow bricks had only adopted a mod of construction known to the ancients, and also applied to some c the early Christian churches in Italy—and in buildings of a more re cent date. He stated that, although not much in use of late year these hollow bricks are now likely to be more generally applied; a owing to a relaxation of the excise laws and the application of ma chinery, they can be manufactured at a less cost than solid bricks- while they possess the advantage of being lighter. It has been sug gested, too, that the hollow bricks may be economically applied i the construction of the partition and external walls of cottages an other buildings, with the advantage of combining dryness with facilit of ventilation. The construction of the arch in question was of som importance from its size, the span being sixty-eight feet and its thick ness one foot. The bricks used by Mr. Rawlinson were twelve inche in length and four inches square, with a longitudinal perforation tw inches in diameter. The weight and cost of the arch thus constructe was one-fourth less than they would have been had solid bricks bee used. The work was set in mortar (formed of Halkin lime used fres and made in a steam-mill), with the exception of five feet on each sid

of the key, which is set in cement. The spandril walls are similarly constructed, at distances of four feet six inches, with circular openings which afford a passage along the sides. On removing the centerings, the arch was found to have deflected only three-eighths of an inch.—*Athenæum*, No. 1121.

PHILLIPS'S FIRE ANNIHILATOR.

A NUMBER of interesting experiments have been made at the London Gas Company's works, Vauxhall, with this remarkable invention. These were preceded by an explanation from Mr. Phillips of the manner in which he was led to the discovery, and of the principles upon which its success depends. He stated, that while watching a volcanic eruption in the Mediterranean, he observed that the huge column of water which was discharged from the crater did not extinguish the flame which accompanied it, while the smoke of a brushwood fire swept by the wind put out another brushwood fire near it. He exemplified the little power of water in extinguishing flame by several very simple experiments: and he then introduced the Fire Annihilator, and at once put out very large fires fed with the most combustible materials. The extraordinary speed, ease, and certainty with which the invention acted in all the trials to which it was put, excited the warm admiration of many gentlemen of high scientific attainments who were present; and there can be little doubt that the patent fire annihilator is a very valuable addition to the discoveries of the age. In construction and application it has the great advantage of being extremely simple, being quite portable, and capable of being placed where it would be most accessible in cases of emergency. The gases which it evolves, and which are found so efficacious in extinguishing flame, are produced from a compound of charcoal, nitre, and gypsum, which is again ignited by breaking a glass bottle containing sulphuric acid. The acid drops upon chlorate of potass and sugar; and instantly a large body of vapour is evolved with great force from a tube connected with the copper or metal chamber in which the whole materials are enclosed. This vapour extinguishes flame with a rapidity which is truly marvellous; and by it Mr. Phillips appears to have arrived at the simplest and most certain means of effecting a large saving in the immense annual loss of property and life by fire in this country.—*Athenæum*, No. 1142.

ROBINSON AND SIMS' SMOKE RESPIRATOR.

A SERIES of experiments have been made, in presence of a committee of the Royal Society for the Protection of Life from Fire, for the purpose of testing the merits of a new Smoke Respirator, invented by two of the Society's men, Robinson and Sims. It consists of a helmet with sight-holes in it, similar to a diver's helmet, to which a respirator is attached, which is drawn close over the mouth and nostrils. *The respirator is so* constructed (by means which have not *yet been explained,) that* the fireman is enabled to breathe freely

in the midst of the most dense smoke, and, consequently, to retain perfect command over all his faculties.

The first experiment was made with damped shavings and saw-dust, in a small room, 19 feet long, 10 feet high, and 5 feet broad. A dense body of smoke, charged with vapour, was produced, in which the two inventors, both provided with respirators, remained for upwards of half an hour, without appearing to experience the slightest inconvenience.

A second trial was made with dry wood, partially coated with some resinous preparation. When the temperature of the room was raised sufficiently high, the firemen entered, and remained there for more than ten minutes, and would have remained longer, if required, with the same success as in the first experiment.

A gentleman present, who was desirous of testing the effects of this dry and heated atmosphere without a respirator, ventured into the room, but came out after a minute or two, pronouncing it to be insupportable.

In reply to a proposition that the inventors should test the efficiency of the respirator in a room, the atmosphere of which was so vitiated by combustion that no light could live in it, Robinson stated that he did not pretend to be able to live in the midst of fire, like a salamander, or to create oxygen; but simply to purify the atmosphere of a chamber in an ordinary case of fire, so as to render it fit for respiration.

Altogether, the result of the experiments appeared to give great satisfaction to the Committee, and were certainly, as far as we could judge, eminently successful.—*Mechanics' Magazine*, No. 1338.

GAS-MAKING.

Mr. Joseph Clinton Robertson, of 166, Fleet Street, has patented certain improvements in the Manufacture of Gas for illumination, and of the residual products into articles of commerce.

First. The gas for illumination is manufactured in manner following from rosin, in conjunction or combination with potash and lime; or soda and lime, or potash, lime, and soda, or any one or two of the said substances, in combination with any other alkaline substances, one, two, or more; and in conjunction also with sawdust, or any other fibrous vegetable matter, in a finely comminuted state. These crude materials are mixed together (in proportions for which no specific rules are given, as almost any combination of them is productive of a beneficial result), and placed in moveable cast iron cases, of a cylindrical or any other form adapted to the shape of the retort in which their distillation is to be afterwards effected; which cases are permanently closed at one end, and have at the other end caps, covers, or plugs, which are fitted to them loosely, so as to be easily driven off by a little external pressure. These cases are placed in a retort precisely similar to an ordinary gas retort, and set like it in brickwork; and they are so arranged as to leave room for the escape of the caps, covers, or plugs when driven off, as aforesaid. This retort being heated in the usual way, the resulting volatile, or

gaseous products, are conveyed by a tube into a second retort of the same description as the first, filled, or nearly so, with lumps of coke or lime, or broken brick, or other like materials in a fragmental state, in order that they may present a large decomposing surface, and heated to a cherry redness previously to the introduction of the gaseous products. If only a very pure gas, for purposes of illumination, is desired to be obtained, the gas which escapes from the second retort is made to travel through a third or fourth retort, filled with materials of the same description, and in the same incandescent state, as those used in the second. But,

Secondly. When it is desired to separate and collect the oil or oleaginous matters, held in suspension by the gaseous products resulting from the distillation in the first retort, these gaseous products are passed through a close tank nearly filled with water, and fitted to an ascension-pipe that leads to a hydraulic main, such as is in ordinary use in gas-manufactories. The water retains the oil or oleaginous matters, or at least the larger portion thereof; while the gas which passes off to the hydraulic main is conveyed thence to a water washer, passed next through a dry lime or milk of lime chamber, and finally transferred to a gas holder.

Thirdly. From the oil obtained in manner aforesaid, an artificial grease of a superior quality is made by mixing it with milk of lime or dry lime, and adding a quantity of zinc, or some one or other of the alloys of zinc, reduced to a granulated state, in the proportion of about five parts of zinc, or alloy of zinc, to each hundred parts (by weight) of the oil.

Fourthly. From the same oil there is obtained a spirit, which may be used both for illumination, and as a varnish or vehicle for colours, by distillation and rectification. In first distilling the oil, care is taken not to raise the temperature higher than is just sufficient to give the oil, which is originally of a yellowish colour, a brownish or tawny appearance. The spirit which comes over from this first distillation is afterwards rectified by re-distilling it once, twice, or oftener, in combination with a small quantity of lime, in each instance, until it attains any required degree of whiteness. The proportion of lime to spirit which is found to answer best in practice is about three-quarters of an ounce of the former to each pound weight of the latter.—*Mechanics' Magazine*, No. 1327.

THE BENZOLE LIGHT.

MR. MANSFIELD has read to the Royal Institution, a paper "On Benzole, its Nature and Utility." Mr. Mansfield described benzole as a spirituous hydro-carbon found in the decomposition of many organic matters; among which certain kinds of coal may be included: from these Benzole is obtained by heat. Having distinguished between native and *artificial tars, by* referring the origin of the former *to the gradual operation of time,* while the latter are produced by the *agency of great heat,* Mr. Mansfield remarked that coal-tar was *separable into, 1. naphtha* which is lighted, 2. dead-oil, which is

heavier than water, and 3. the solid substance, *pitch*. Coal-tar also admitted of a division into three chemical groups—*neutral*, *acid*, and *basic*. To the neutral group benzole belonged. It is obtained from the light naphtha, which consists of a mixture of hydrocarbons possessing different degrees of volatility, and which form a series, the composition of each member of which may be expressed by adding $_2H + {}_2C$ to the formula of the substance preceding it in the scale. Each of these oils may likewise be obtained from a peculiar organic acid by a method exactly analogous to that by which benzole is derived from benzoic acid, viz., by distilling it with lime, which removes two atoms of carbonic acid. Benzole was discovered many years ago by Mr. Faraday, from the oil-gas-liquor, and designated by him as "bicarburetted hydrogen." Mitscherlich obtained it from benzoic acid, and defined its exact organic arrangement as $C_{12} H_6$. The procuring this substance from coal-tar naphtha, hitherto a tedious process, was facilitated by a still, contrived by Mr. Mansfield, to produce it in a state of nearly absolute purity. The volatility of benzole, as compared with other oils of coal naphtha, appeared from its kindling at the surface on the approach of a lighted match.

Notwithstanding its inflammability, this substance, in consequence of the large quantity of carbon which it contains, is useless as a source of light without some special adjustment. This adjustment, as contrived by Mr. Mansfield, consists in a stream of atmospheric air, obtained from a gas-holder, which is filled by a pair of bellows. This gas-holder was connected by a pipe with a reservoir of benzole, from which other pipes communicated with [illegible] ners. The result was that the air, in passing through the l[illegible] of its vapour to produce a brightly luminous g[illegible] in several jets during the greater part of [illegible] It was suggested that this light might frequ[illegible] gas where that product was inadmissible. [illegible]

Other properties of benzole were then notice[illegible] naphtha which are liquid at common temperatu[illegible] when placed in a freezing mixture. When thus [illegible] like solid was obtained, from which a liquid was expre[illegible] perfectly pure benzole. The solvent power of benzole [illegible] to as affording another illustration of its nature and util[illegible] *saturable*, where it mixes in any quantity with other oils; 2. *Sa*[illegible] where the substance, after being taken up in definite quanti[illegible] recoverable by simple evaporation of the solvent, no new chem[illegible] compound being formed (as in the case of phosphorus, sulphur, and gum-copal); 3. *Saturable, in which a definite new compound is formed.* It was shown that when benzole was dissolved in nitric acid of sufficient strength, its nature was entirely changed; a new oil resulted heavier than water, and having the odour of bitter almonds. The formation of this substance from benzole was illustrated *mechanically by a diagram*, on which the elements concerned in the reaction *being represented* by their chemical symbols, the movement of the *letters indicated* the mode in which the transformation was effected

was shown by the same diagram, and illustrated experimentally, t this nitro-benzole was further convertible into aniline, the re-rkable alkaloid discovered by Dr. Hofmann. It was explained how m aniline, by successive artificial additions of other elements, a ies of bases were built up, rivalling in complexity the composition quinine and the other natural alkaloids, the imitation of which is great an object with many chemists of the present day.

NEW GAS GENERATOR.

A PATENT Self-acting Gas Apparatus has been exhibited at Hull, cording to the *Packet*, by English's Patent Camphine Company. ie gas which it generates (from camphine or mineral oil) is said to oduce a light far purer and more brilliant than that of coal-gas, and thout the least noxious vapour. The apparatus consists of a fur-ce of cast-iron, divided into two compartments, in one of which e retort is set; the other being filled with fuel, descending into the rnace, exactly as the combustion proceeds. In the lower compart-ent is fixed a double retort, having at one end, outside the furnace, short vertical pipe. At a little distance is the gasometer; and above, vessel containing the fluid, and connected with the retort by a small ibe. The fluid flows through the upper along the lower compart-ent of the retort, being decomposed in its passage; it then passes irough a syphon-box for the receipt of any undecomposed fluid; ience through a washer to the gas holder. Should the gas be gene-ited too rapidly for the burners which are lit, the rising of the gas older immediately raises a lever and cuts off a portion of the supply f fluid. The apparatus can be adapted to any number of lights for ublic buildings, churches, lighthouses, private houses, road-side ilway stations, hotels, and other places where coal gas cannot be btained. It is also stated to cook with cleanliness and nicety.—*Builder*, No. 341.

CANDLE-MAKING.

Mr. JAMES CHILDS, Earl's-court-road, Old Brompton, Middlesex, as patented certain improvements in the Manufacture of Candles, light Lights, and Candle Lamps, viz.:—

1. In bleaching palm oil, tallow, and fatty bodies by the application f oxide of chlorine, in the following manner:—One ton of palm oil s heated to a boiling point in wooden vessels by free steam, then llowed to settle, and mixed with 2 lbs. of chlorate of potass, 4 quarts f sulphuric acid, sp. g. 1·8, diluted with an equal quantity of water. t is then boiled for twenty minutes, and 1 pint of sulphuric acid, ikewise diluted with water, added to it; after which it is allowed to ool, when it is ready for use.

2. In coating the wicks of tallow candles, which do not require nuffing, with stearic acid.

3. In making the night lights of different materials in horizontal trata—the top one of a long-consuming, and consequently expensive

substance, and the bottom one of a quicker consuming and cheaper substance.

4. In constructing the cases or boxes of night lights of wood, instead of paper, as heretofore; or,

5. Constructing the cases of sheet metal, which, from its indestructibility, will prove (so it is stated) more economical than either the preceding or any other method.

6. In manufacturing the nozzles of candle lamps of glass or earthenware instead of metal, in order to prevent, as much as possible, the communication of heat from the flame to the tallow.

PRICE'S PATENT CANDLE COMPANY'S WORKS, VAUXHALL.

An interesting account of these extensive Works appears in No. 402 of the *Illustrated London News*, accompanied by four engravings of the principal departments of the manufactory.

"At the present moment above 700 hands are employed in the establishment, in addition to immense steam and hydraulic power; and upwards of 4,000 tons of palm and cocoa-nut oil per annum are here manufactured into candles. The works at Belmont have, in a few years, extended progressively with the demand for the manufactures, until they cover an area of nearly two acres. The Company has also very large branch works at Battersea, and occupies a score of the capacious dry arches of the South-Western Railway. In addition to these home-works and premises, the Company possesses cocoa-nut estates in Ceylon, and extensive mill-works there for the manufacture of cocoa-nut oil. The Patent Candles, however, are principally made from another species of palm growing on various parts of the coast of Africa, and botanically known as *Avoira Elais*, and *Elais Guinaensis*. As soon as the palm-oil is received at the wharf, it is liquified by passing through it a steam-pipe. The oil, thus dissolved, which is of a bright orange colour, is conveyed through a pipe to reservoirs. From these reservoirs it is, by chemical processes, converted into an acid, and becomes a discoloured concrete mass. These processes being completed, the material is again loaded into barges, which are taken up to the branch works at Battersea. Here the discolouration of the material, engendered by the previous processes, is expunged.

"From Battersea the material is re-conveyed to Belmont, where, upon being landed, it is taken to the spreading and stripping department. Here the purified palm-oil is carried in large masses to a machine, and, by means of an endless strap, is carried against a revolving cutter, which shaves it into
ieces sufficiently small to pass down the sliding tube, attached to which is
like iage provided with two heavy rollers. Falling upon this carriage, the
perfe ial is spread upon cocoa-fibre mats, in layers of an equal thickness,
ted by an iron frame. Each layer of the material is covered by another
to as d when sufficient masses of these composite layers have accumulated,
saturc dragged on trucks to the pressing department. In these rooms
where rty-two powerful hydraulic presses, worked by applying steam power
l pairs of pumps, the bands of which are driven up or down two
recover cording to the power required. When placed in the press, an iron
compou troduced between each pair of mats, to counteract the spongy effect
gum-cop e would otherwise have to encounter. The object of applying this
ydraulic power is, to extract from the stearine the oleic acid,
formed. is forced from between the mats, trickles down into a vessel
of sufficie reive it. After the mats, with the layers of stearine between
resulted hea een submitted to the utmost power of the hydraulic pressure,
ture of the atmosphere, they are, for the purpose of farther
The formati oleic acid, again placed in hydraulics, and removed to a second
nically by a heated by steam to 120 degrees. After undergoing this
being represe pressing, the mats are taken to the stripping-bench, where
letters indicat ed from them. This material is next conveyed to the boiling-

here it is placed in vats, and again reduced to a liquid state by the on of steam, conveyed through coiled pipes into the vats.

stearine has by this time reached a sufficient state of purity to be tured into candles, and is therefore conveyed to the candle moulding ent. Each of the moulding frames has fitted to it a box contain- iteen reels, and upon every reel are wound sixty yards of plaited ick. The ends of these wicks are passed through eyes at the top of lds, and are held above the upper part of the moulding-frame by a rceps. The moulding-frames being wicked, are passed along a rail- ough a closet heated by steam pipes. The heating of the moulds is om the French method, which was invented at the time the use of vas declared illegal in France. The *rationale* of the exploded arsenic has been explained:—When the moulds were used cold, it was tice to pour in the candle material (stearic acid) at a high heat (240°), nt its being instantly and irregularly congealed, by coming in contact cold metal of the moulds. During the long time which this heated l required for solidifying, it crystallized, causing the candles to have ed unequal surface; a small quantity of arsenic was therefore added, by combining with the stearic acid, prevented the crystals forming. present process, which has entirely superseded the arsenic one, the g of the moulds has removed the necessity of heating up the material, herefore, is poured in almost at its congealing point; and the mould the same temperature, the material hardens into one uniform mass ny crystallization can take place.

moulding-frames, already described as being wicked, having become itly warm by passing through the heated closet, are raised by a lever lling machine. The liquid material runs into the moulds and fills nd then the frame is pushed upon a carriage, and transferred to line of railway, along which it passes to the candle-drawing machine. ration of this machine is a very interesting part of the process. A amrods, provided with a spring catch, which lays hold of the mould- ishes them, with the candles attached, through the moulds (as pellets en through a pop-gun), and thus, by a single operation, draws one set les, and wicks the next set. The candles just drawn are held down ing catch, and the wicks cut off evenly by a traversing circular knife. operations are repeated with great rapidity. In each set of the ng-frames, constituting a candle-machine, there are, when first d, ninety-two miles of wick; therefore, supposing the six machines ve saw at work were started simultaneously, above 500 miles length les would be made in exhausting one single wicking of the machines! candles, as they become released from the moulds by the drawing e, are conveyed in boxes to the Packing Department, where they are in sealed packets with marvellous rapidity.

factory, unlike its neighbours, consumes its own smoke. Viewed e Thames, its chimneys appear to belong to some unoccupied factory; h, unfortunately, has the presence of smoke become associated with ion of a brisk trade; but these apparently idle chimneys are dis- g weekly, by night and by day, the entire combustible products of s of fuel in furnaces of more than a thousand horse power! Both 's and Hazeldine's furnaces, which are employed, besides consuming ke as fuel, feed themselves with the refuse coal of the London market, ce per ton much below that paid for the ordinary steam coal.

re are in active operation the following auxiliaries to the staple cture of this establishment: a laboratory, engineers, carpenters, , coppersmiths, and weavers' shops, forges, a cooperage, a sealing-wax ctory, and a steam printing machine.

principal part of the buildings in which these multifarious occupa- re carried on, are of corrugated iron, by which precaution they are d nearly fire-proof. In addition to this foresight, copious supplies of with hose ready fixed, are kept in reserve at various points."

substance of the foregoing details has been furnished to the by Mr. G. F. Wilson, the able managing director of the ny's *Works*.

HEATING BY GAS.

Mr. Defries, of Grafton Street, Fitzroy Square, has patented certain "improvements in applying Gas to heat apparatus containing fluids, and in heating and ventilating buildings."

The first improvement is in the method of applying gas to heat baths. The bath has a double bottom, the upper one plain, and the lower corrugated; and, being corrugated, it presents a larger surface for the absorption of heat emitted by gas-burners placed below it than if plain.

The second improvement consists in applying the heat evolved from gas lights, when used for illuminating purposes, to heating fluids. The heated products of combustion are conveyed by pipes to any convenient spot. Around these are other pipes containing the fluid to be heated, which may be drawn off as required; or it may be made to circulate in pipes for heating apartments.

VANE GAS-CHANDELIER.

Messrs. Abbot and Co., of Gateshead Park Iron Works, have manufactured for the Mosque of Aurora, in Constantinople, an enormous Gas-Chandelier. The circle on which the lights are fixed is 8 feet in diameter. The dome of the mosque rises 65 feet from the floor, and the diameter is 40 feet. In accordance with instructions, the design is plain, yet elegant. The material is brass, French-bronzed. The ornamental work consists wholly of foliage. Crosses or glass drops, figure of man or beast, Messrs. Abbot were forbidden to introduce. Additional burners and glasses are to be sent, with several yards of caoutchouc or gutta percha tubes, from which we may infer that moveable lights are wanted.

HEATING.

Mr. James Godfrey Wilson, engineer, Chelsea, and Mr. William Pidding, Pimlico, have patented certain improvements in obtaining perfect combustion, and in apparatus relating thereto; the same being applicable to every description of furnace and fire-place, as also to other purposes where inflammable matter or material is made use of.

These improvements consist in introducing and distributing jets or streams of atmospheric air among the burning fuel of a furnace or stove, and in mixing them with the flame of a gas-burner, or spirit or oil lamp; also in constructing air-passages in the wicks of mould candles.

Amongst the patentees' claims are the mode of constructing and arranging apparatus applicable to stoves and domestic grates; the adaptation of hollow air-passages to gas-burners, or oil or spirit lamps, whereby the combustion is assisted and more perfectly obtained by the introduction and mixing jets or streams of atmospheric air with the flame of the gas or liquid.

4. Constructing hollow air-passages in the wicks of mould candles.

IMPROVED STOVE-GRATES.

Mr. Newton, of Chancery Lane, has patented certain improvements in Stoves, Grates, or Fire Places; and in Warming or Heating buildings.

The patentee describes and claims—

1. The employment of a transparent shield in front of the grate, which may be moved up or down, as required, to regulate the quantity of air admitted to the fuel, and consequently the draft.

2. A low-placed stove, recessed in the fire-place, fitted with a chamber in combination with a hood, for consuming smoke and the gases which are produced by combustion.

3. The combination in a stove of this description of a hood and smoke chamber, with an exterior casing, into which air is admitted and heated previously to its entry into the apartment.

4. An arrangement, for heating and warming buildings, of horizontal and vertical pipes, and smaller service-pipes, the essential feature of which is making the service-pipes, or sets thereof, communicate near their ends with the supply-pipes, so as to establish a constant circulation of hot water to and from the boiler.

5. The construction of a boiler for the purpose of the last head of this invention, which consists of a vertical fuel tube resting on the top of the incandescent mass in the furnace, and which is surrounded by a concentric tube, serving as a flue, which is enveloped by a concentric tubular boiler.

DAMASCUS IRON MANUFACTURE.

A paper has been read to the British Association, "On the Manufacture of the Finer Irons and Steel, as applied to Gun Barrels, Swords, and Railway Axles," by Mr. W. Greener. The first innovation on the principle of manufacturing gun-barrels entirely from old horse-nail stubs, was due to the late Mr. Adams, of Wednesbury, who brought out what is termed Damascus iron: this is constructed of alternate layers of steel and iron faggotted, drawn down into rods, then tortuously twisted; and when welded into barrels, it forms the Damascus barrel. The success of this experiment, both in point of beauty and strength, was so great as to be under-estimated at 50 per cent., as compared with the strength of stub twist iron. The next experiment was to blend more intimately than the above, steel with the horse-nail stubs, in the proportion of one to two of the latter. The paper described the mode of this; and then went on to narrate that the next and most important improvement in metals was the manufacture of gun barrels from scrap steel entirely; and for this purpose, old coach wheels were generally in request. By clipping these into pieces, perfectly cleansing them, and welding them in an air furnace, a metal is produced which surpasses in tenacity, tenuity, and density, any fibrous metal ever before produced. The tenacity of it when subject to torsion in a chain testing machine is as 8 to 2½ over that of the old stub *twist mixture.* The perfect safety of barrels produced *from it is astonishing;* no gunpowder yet tried has power to burst

them when properly manufactured. These experiments l others on a more extensive scale; to effect this, ingots c were taken from the mill made to No. 3 in the scale of ca These, after rolling into flat bars, were clipped into small imediately mixed and welded as before in the air furnace, into rolls, and refaggotted; these were subsequently drawı were then ready for being made into gun barrels, either w out spirally twisting them; to form Damascene barrels fr perfectly safe; this was ascertained by experiments. covered that the density and tenacity of the metal was great to effectually resist the enormous force of this great powder. The manufacture of swords was another articl this improvement applied. All the investigations of the tended to satisfy him that the Arabs thus produced their pered Damascus swords, namely, using two steels of diff nization, mixing them in the most intimate manner, a them many fantastic ways, but observing method in that it was a fact that no European sword has ever yet bee equal to the Damascus. The Government inspector of was of opinion that the swords made in Birmingham were used in the army. The writer's investigations had satisfi tempering by crystallizing the steel—that is to say, temp ordinary way, was far from the wisest. The Damascus fibrous state or hammer hardened, is more difficult to br per cent. than the best English-made blade. This had but temper it in the same way, and it showed no greater t our own; the Damascene figure was destroyed by the carl ing equally diffused; nor would acid develope it—it was e From these and other facts the conclusion might be drawn constructed of dissimilar steels—tempered by condensation —either by repeated rollings, hammering, or many othe which our perfect machinery gave us the facility to do— Therefore, in time we might hope to see every soldier of armed with a weapon as good, if not so costly, as prized Damascene. The remaining part of the paper r subject already much discussed—the manufacture of railv *Athenæum*, No. 1143.

MANUFACTURE OF DAMASCUS BLADES.

Nicola Milonas, for some time consul in the East, in ing to discover the process employed by the Kourdes in t ture of their Sword Blades, observed—1. That the man which these blades were made were situated at the decl mountain, near cascades, the water of which, falling fr rock, arrived in the most limpid state in the reservoirs co *its reception*, in which reservoirs the blades are tempered. *servoirs are* themselves placed in situations where the air *These conditions* of purity of air and water are conside *for the success* of the operation. 2. Iron of the pure

. Submitted to a very high temperature, the first tempering is enced when the iron is at a white heat; the metal is exposed fusion, the fuel employed being placed on each side of it; the t iron is then covered as quickly as possible with fatty and oily s—paste made from bones, wax, &c. This operation tends, ing to the manufacturers, to render the blade flexible. The tempering is performed by the same process, with these differ- that the heated iron, after having thrown off considerable quan- f sparks, and having been exposed, is covered with a paste com- of powder bones and purified mutton suet. The third temper- effected by disposing the metal in such a manner that it may be by a man on horseback who rides at full gallop, in order that ide, which he keeps in an elevated position, may receive the im- n of the air. 3. The fuel employed is anthracite and turf. In o obtain favourable results, it is necessary to use fuel entirely m sulphur, and combine as much as possible the heating of , vegetable, and mineral substance.—*Mining Journal.*

AMERICAN METHOD OF TEMPERING EDGE TOOLS.

heating axes or other similar articles, a furnace is constructed, form of a vertical cylinder, the exterior being made of sheet- ned with firebrick, 4 feet 8 inches diameter, or of such outside r as to give it an inside one of 4 feet, and 3 feet high. In the of this cylinder several fire-chambers are formed—usually The inner wall of each fire-chamber is 18 inches long, 4 inches ont to back, and about 4 inches in depth—forming in the circle of 3 feet 4 inches diameter. Under each there are grate d air is supplied through a pipe connected with a blowing ap- A circular table of cast-iron, 3 feet 4 inches diameter, is revolve slowly on the level with the upper part of the said r. This chamber is sustained on a central shaft, which passes rough the furnace, and has its bearing in a step below it; a eyed on to it serves to communicate rotatory motion to the When the axes or other articles are to be heated, they are pon the table, with their bits or steeled parts projecting so its edge as to bring them directly over the centre of the the table is kept slowly revolving during the whole time of When duly heated, they are ready for the process of harden- e hardening bath consists of a circular vat of salt water; e tub or vat, a little above the surface of the liquid, is a wheel, horizontally with a number of hooks around the periphery, ich the axes or other articles are suspended. The height of s from the surface of the liquid is such as to allow the steeled to be immersed. As soon as the hardening is effected, the re removed from the hooks, and cooled by dipping in cold With the *best cast-steel*, a temperature of 510° Fahr. has *d to produce a good* result in hardening in about forty-five -*Scientific American.*

NEW USE FOR IRON.

THE *Philadelphia Ledger* states that Messrs. Wickershane and Walker of that city have the patent right of a machine, which, with sufficient power, is enabled to weave into meshes iron as large as the largest railroad bars, or as small as the smallest description of wire. This method of operation does away with the necessity for rivets, in lieu of which an indentation into the wire is substituted, forming a socket for the next wire. With this machine, the following articles can be produced :—A material for carriage bodies, light, durable, and at less cost than wood ; wire railings of endless variety, forming a guard for land enclosures, at much less cost than simple chains ; wire tree boxes, some of which have already been put into use ; sacking-bottoms, window-shutters, guards and grating for stove-doors, and windows' net-work for the decks of vessels and steam-boats ; gratings for prisons and sky-lights ; besides an endless variety of uses to which the material can be applied through the aid of this improvement.

IRON MADE BY A SINGLE PROCESS.

MR. SMITH SALTER, of New York, has patented a new method of Making Iron direct from the ore, with anthracite or bituminous coal, by a single process. By means of this remarkable invention, Mr. S. proposes to make wrought iron at a cost of 25 to 30 dollars per ton —at least half the usual cost. His furnace has three combined chambers, one above the other, and all actuated by the same fire. The upper chamber is used for deoxidizing the ore—impurities, such as sulphur, &c. being carried off at a low temperature ; the middle chamber for fluxing and working ; the lower chamber for reducing and finishing. The metal is taken from the last named to the hammer or squeezers. The whole time occupied in the process is only two hours !—*New York Paper.*

GOLD TESTS.

PROFESSOR TENNANT states, in a lecture before the Society of Arts, that the specific gravity of gold had been tried by four different tests. The following has been the result :—15·, 15·$\frac{7}{10}$, 16½·, 17·, so that, as a mean, the specific gravity of gold was 16 times greater than water ; while that of copper pyrites was 4·5 ; iron pyrites, 4·3; mica, 3·. The blow-pipe is likewise a most useful and simple instrument ; this can be used with a penny candle and a halfpennyworth of charcoal—so that, for eightpence or tenpence, a primitive furnace to commence operations with can be purchased. Gold may be cut with a knife like lead, and bent and beat out in thin leaves. Iron pyrites cannot be cut, or even scratched, with a knife. Copper pyrites can, and both are brittle. Mica, foliated and elastic. The blow-pipe applied to gold, it retains its colour ; while copper and iron pyrites lose theirs, and the latter becomes magnetic. Gold is also not acted upon by nitric, muriatic, or sulphuric acid singly ; brass filings will be readily acted upon by nitric acid ; when the two former are combined, it is only then soluble. If any of the other three minerals were reduced to powder, either of these acids will readily act on them

OXIDATION OF RAILS IN AND OUT OF USE.

An interesting paper on this subject, by Mr. Mallett, was read at the late Birmingham Meeting of the British Association. The conclusions at which Mr. Mallett has arrived are the following:—The top surface of a railway bar in use is constantly preserved in a state of perfect cleanliness, freedom from oxidation, and polish; while the remainder of the bar is rough-coated, originally with black oxide, and soon after with red rust (peroxide and basic salts). Not only is every metal electro-positive to its own oxides, but the polished portion of a mass of metal partially polished and partially rough is primarily corroded on the rough portion. Hence a railway bar while in use is constantly preserved from rusting by the presence of its polished top surface. Such polished surface has no existence on the rail out of use. The upper surface of the rail in use is rapidly condensed and hardened by the rolling of the traffic over it; and all other circumstances being the same, the rate of corrosion of any iron depends upon its density, and is less in proportion as this is rendered greater by mechanical means. As every metal is positive to its own oxides, the adherent coat of rust upon iron, while it remains, powerfully promotes the corrosion of the metal beneath, and this in a greater degree in proportion as the rust adherent is of greater antiquity. It has been shown that the rust produced by air and water, which at first contains but little peroxide, continues to change slowly, and becoming more and more peroxidized, becomes more and more electro-negative to its own base. Now, the rust upon a railway bar out of use continues always to adhere to it, and thus to promote and accelerate its corrosion, while the rust formed upon a railway bar in use is perpetually shaken off by vibration, and thus this source of increased chemical action removed. To recapitulate: railway bars forming part of a long line, whether in or out of use, corrode less for equal surfaces than a short piece of the same iron similarly exposed. Rails in use do corrode less than those out of use. The difference is constantly decreasing with the lapse of time. The absolute amount of corrosion is a source of destruction of the rail greatly inferior to that due to traffic. It is highly probable that the electrical and magnetic forces developed in the rails by terrestrial magnetism, and by rolling traffic, re-act in some way upon the chemical forces concerned in their corrosion; and that, therefore, the direction of lines of railway in azimuth is not wholly indifferent as respects the question of the durability of rails. The author concludes with two practical suggestions, deducible from the information obtained:—1st. Of whatever quality iron rails are rolled, that they should be subjected prior to use to an uniform course of hammer-hardening all over the top surface and sides of the rails; and 2ndly, that all railway bars before being laid down should, after having been gauged and straightened, be heated to about 400° Fahrenheit, and then coated with boiled coal tar. This has been proved to last more than *four years as a coating* perfectly impervious to corrosive action, *while constantly exposed to* traffic.

COATING METALS.

MR. A. PARKES, of Harborne, Sheffield, has patented cer provements in the deposition and manufacture of certain Me Alloys. The improvement in depositing metals consists in coat tubes, sheet iron, or other metal, with two or more of the foll copper, silver, lead, tin, zinc, or bismuth; for instance, ir zinc, and then copper on the zinc; or, first silver, then copper then bismuth, then tin; the metals to be deposited from the tions in the ordinary manner by electro-decomposition. The claims the depositing alternate layers of different metals, but manner of accomplishing this. The patentee's improvement manufacture of certain metals consists in forcing atmospher either pure or mixed with chlorine, or a hydro-carbon, *i. e.*, coal gas—on the surface of the melted copper in the furn which purpose he prefers to use that kind of blower which fc air by means of two interstitial cams. When the copper is me adds from one half to three per cent. of phosphorus.

CAST ZINC IN DECORATION.

M. GEISS, of Berlin, has been exhibiting specimens of Z for architectural and Decorative purposes in a mode not hithe ployed in England—namely, *cast*. It appears that for se years, zinc has thus been used in Berlin for architectural pu namely, for all exterior as well as interior ornamental parts o ings, which, by casting, can be produced in the sharpest forn are said to be at the same time capable of resisting all influen weather. Columns, capitals, consoles, acroteria, cornices, d for doors, balconies, vases, statues, &c., can be formed of zin

The late distinguished architect, Schinkel, thus writes on t ject:—

"The cast metal offers particular advantages from its strength in comparison with rolled zinc, from its being less to the influence of temperature, and from its capability of r the finest impressions by casting, for which reasons it seen adapted for all plastic works of art.

"We see, therefore, already large statues, copies of antique atelier of M. Geiss, at Berlin, executed in the most elaborat to which statues, by a precipitate of copper, an excellent imit copper can be given. All ornaments of carved work, and pr members, forming perforations, and crowning members, are of being executed of this metal in the easiest way. At the sa the more important parts of building can be made very ch durable. We have recently finished a large restoration of o versity, in which about 1,600 feet of cornice, with modillio been cast in zinc, which was fastened to an iron framewo which, instead of sixteen dollars per foot if in stone, cost in z nine dollars, including the iron framework.

"The many advantages which zinc offers for the constru *furniture, as vases*, candelabra, basins, &c., &c., which in the

are less exposed to damage than stone, and for the clothing of rough iron supports, with the elegant forms of columns and consoles, dressings for doors, and richly ornamented architectural members, show clearly the extent of its extreme usefulness, and will render it in future indispensable for architecture, contributing at the same time more and more to the extension of architecture itself."

IRON ROOFS.

At a meeting of the Liverpool Polytechnic Society, Mr. Turner, of Dublin, who has been engaged in constructing the new Galvanized Iron Roofing and other iron works of the Lime-street railway station, furnished the following particulars:—The roof covers an area of 6,140 square yards, being about 360 feet in length, and 153 feet 6 inches in width. There are no intermediate columns; but this great space is spanned over by one stupendous arch, rising in a segment of a circle, to a central height of 30 feet from the spring or chord. The roof consists of 17 curved girders of wrought-iron, resting at one side upon the walls of the offices, and at the other upon cast-iron columns of the Doric order, connected by ornamental arches, in perforated iron. These girders are trussed vertically by a series of radiating struts, acted upon by the bars connected with the extremities of the girders; and they are trussed horizontally by a series of purlins and diagonal rods, thus forming one rigid piece of framing from end to end. Upon this framing will be laid plates of galvanized corrugated iron, and three ranges of plate-glass (in sheets about 12 feet 6 inches in length, and of great thickness), extending the whole length of the roof. In consequence of the great extent of surface exposed to the variations of temperature, provision has been made for expansion and contraction of the iron without injury to its bearings. The roof, when finished, will weigh about 700 tons. The whole of the work, with the exception of the cast-iron columns and ornamental arches, is of wrought-iron. The iron columns upon which the roof rests on the south side of the yard are 2 feet 3 inches in diameter at their bases. Six of the girders are fixed, and the centre struck.

CONSTRUCTION OF LIGHTHOUSES—LIGHTHOUSE ON COHASSET ROCKS, U. S.

From the official Report of Captain Swift, under whose direction this Lighthouse is being constructed for the American Topographical Bureau, we learn that the form of the lighthouse frame is an octagon, of 25 feet diameter at the base; the structure is formed of eight heavy wrought iron piles, or shafts, placed at equal distance from each other, with one also at the centre. The piles were forged in two pieces each, and are connected together by very stout cast-iron or gun metal sockets, the interior of which is bored; and the pile ends are turned, and secured to the sockets by means of large steel keys, passing through the piles and sockets. Above and below the joints or sockets, and connecting the middle pile with each outer pile, there extends a series of *wrought iron braces*; the outer shafts are connected to-

gether by similar braces, extending from one to the other,—and thus the whole structure is tied together.

The keeper's house is octagonal in shape, and 14 feet in diameter; the uprights, or stanchions, are of cast-iron, and rest upon the cap immediately over the pile heads, where they are secured with bolts and keys. These uprights are cast with double flanches, between which 2-inch plank, grooved and tongued, are to be fitted horizontally: at right angles, another series of plank is to be set on end vertically, and, together, these form the side or frame of the house; upon this frame the roof will be placed, and, finally, upon this, the lantern will be set up.

The drilling of the holes for the lighthouse occupied the better part of two seasons. The erection of the iron structure in place, it may be conceived, was comparatively a work of much less difficulty; and, with favourable weather, an undertaking not requiring much time. The triangle and drilling machine was swept from the rock twice during the first season's operations, and the men were frequently washed from the rock, but happily no lives have been lost. The holes were all finished on the 16th August; that is to say, nine holes of 12 inches diameter and 5 feet deep.

The entire height of the structure from the surface of the rock to the top of the lantern will be about 70 feet, and upwards of 50 above the line of the highest water.

The entire weight of the iron work is about 70 tons; of this upwards of 40 tons is wrought iron, the residue of cast iron. The average weight of each complete shaft is about 8,200 lbs. The cast-iron couplings for connecting the upper piles with the lower are 3 feet long, and weigh nearly 800 lbs. each; they are made of the best gun metal. The weight of the lantern and illuminating apparatus is about 4½ tons.—*Builder*, No. 323.

IRON HOUSE EXPORT TRADE.

Messrs. BELLHOUSE and Co., of the Eagle Foundry, Manchester, have constructed of iron, and shipped for California, two large Dwelling-houses, of which the following interesting description is given in the *Manchester Examiner* and *Times*:—

"These houses of Messrs. Bellhouse and Co., combine elegance and comfort in a surprising degree, considering the material of which they are composed, and are peculiarly fitted for the purpose to which they are to be devoted; namely, the residences or lodging-houses of some of the Californian aristocracy. The extreme length is 27 feet by 22 feet in width; and each house is two stories in height, each story containing four rooms, passages, staircase, &c. The lower rooms are 9 feet 3 inches, and the upper rooms 8 feet high, with an additional 4 feet above occasioned by the curvature of the roof. The foundations are similar to those used in the wrought-iron storehouses, viz., strong beams of timber securely fastened together. From this foundation rise strong iron plates and principals, to the roof; and the floors, which are constructed of 3-inch deals, rest on strong angle

irons, running along the sides, ends, and divisions. All the divisions and partitions are formed of sheet iron one-eighth of an inch thick, and lined with boards. All the rooms are lined with three-quarter-inch grooved boarding, strengthened by battens; and the exterior of the house is covered with sheets of corrugated tinned iron, averaging 6 feet by 2 feet. These sheets of iron are now merely bolted on; hence, in some places daylight was discernible between them, but on reaching their destination they were to be riveted to cross-bars made to fit the corrugations. An immense strength and power of resistance is obtained by the employment of corrugated iron. This may be seen from the fact that the plates which are used in this instance (plates No. 24 wire gauge) are able, when the ends are placed upon supports, to bear the weight of an ordinary sized individual. It must, therefore, be apparent that an immense amount of pressure from without will be necessary to injure in any way the iron facing of these San Franciscan residences. The plates are also tinned, or covered with some solution of that metal, by which rust will be entirely prevented —at all events for a long series of years, It also gives to the house a peculiarly light appearance, something like frosted silver; and in a warm climate the advantage of this must at once be obvious: the rays of the sun will be radiated from the surface,—thus the extreme heat, which might otherwise be experienced, will be obviated. The front rooms of the ground floor are 12 feet square, and back rooms 12 feet by 10 feet. One of the upper rooms is 15 feet by 12 feet. The roof, which is curved, overhangs boldly, and the ends will be ornamented by elegant pendants of cast-iron. Over the door-way will be placed an ornamental canopy of galvanized iron, and the gutters and spouts are of the same material. The doors are formed of one plate of wrought-iron, with wrought-iron frame-work on the side next to the passages, ornamented with moulded panel bars, which are riveted to the inside face. The plates are an eighth of an inch, and the bars about half an inch, thick. The doors are provided with brass locks, wards, and furniture. Each of the rooms is furnished with one window, and the casements are affixed to cast-iron frames, in one piece, requiring merely some half-dozen bolts to fix them. They open inwards in two casements, and the panes are cut to a square and diamond pattern. The small diamonds are filled in with red and orange-coloured glass, which gives a beautiful and rich appearance to the window. The outer shutters are composed of strong wrought-iron plates, fastened simply, but very securely. The floors are tongued with iron at each joint, so that they are quite air-tight. The whole of the sides of each room being coated with iron, the doors being made of iron, and the floors being made of 3-inch planks, the houses may be considered fire-proof. At all events, suppose one of the rooms should take fire, it is impossible that it could spread any further than the chamber in which it originated, and the probability is, that long before the roof is properly ignited, the fire could be easily extinguished. The ceiling of the *lower rooms* will be formed by the under side of the *planks forming the floor* above, and the ceiling of the upper rooms

will be made of three-quarter inch boarding, leaving a cavity above, formed by the curvature of the roof, for ventilation. In the kitchen there is a large fire-grate, with cooking apparatus, and the chimney is carried through the gable end of the building, outside. The whole finishing of the house, the cornices, skirtings, &c., is very superior for houses of this description.

They have been constructed at a very moderate cost—about £450 to £500, we believe.

Cast-iron cottages and warehouses have also been constructed in Belgium, and shipped at Antwerp for California. Mr. John Walker, of London, has manufactured several houses of corrugated iron; and among them a storehouse 75 feet long, 40 feet wide, and 20 feet high, composed of plates each 8 feet long: the cost being £600.

ROLLING IRON.

A PAPER has been read to the Institution of Civil Engineers, entitled a "Description of a Method of Rolling Bars for Suspension Bridges, and other like Purposes," by Mr. Thomas Howard. It was described that by the ordinary process of manufacture, the head, or end of the link, out of which the eye, or hole for the connecting pin, was bored, had been sometimes welded on to a parallel rolled bar, or, at other times, been hammered to the required form; both these methods were, however, objectionable, owing, in the former case, to the insecurity, and in the latter to the tediousness and expense. By the method introduced by Mr. Howard, the bars were rolled at once into the requisite form; the shingle, or faggot, was first passed longitudinally, at a welding heat, through grooved rollers, in the ordinary manner; and then, before being drawn down to the intended thickness, was carried to rollers having bosses, or increased diameters at the places corresponding to the heads to be produced, and there passed to and fro between the rollers transversely, or across the breadth of the bar; thus receiving a pressure only at the enlarged parts of the rollers, which gave the necessary increase of breadth at the heads; it was then taken to plain finishing rollers, and drawn out longitudinally in the usual manner, until it attained the required length and thickness; the heads being afterwards trimmed by machinery to the exact dimensions, and the holes drilled for the pins. It was stated that the chains of the large suspension bridge, erected by Mr. W. Tierney Clarke over the Danube, at Pesth, which lately so satisfactorily withstood the heavy strain brought upon it by a retreating army, were constructed on this system.

SHAPING METALS.

Mr. JOHN FREARSON, of Birmingham, has patented improvements in Bending or Shaping. The metal, as supplied hot from the rollers, is drawn by tongs with a to and fro and closing and opening motion between a pair of cutters, and slantwise, across a mandril or die. The requisite length is cut off, and then drawn by the mandril between a pair of grooved rollers, supported in levers side by side. As the iron is drawn through, the rollers approach by cams acting on the [illegible]

ends of the levers, bending it completely round the mandril. The link, when completed, is removed by the mandril being made to slide back, and by the forward action of a catch interposed between the link and sliding plate in which the mandril is supported. The different parts are worked from the main shaft by an arrangement of cams and levers, too complicated to be described without diagrams.

NAIL-MAKING.

MR. MOSES POOLE has patented some Improvements in Machinery for Making Nails. The metal is passed between the edges of a top and bottom roller, to split it into rods of the requisite thickness; these are passed between the edge of a second top roller and the other edge of the bottom roller, whereby they are formed into a succession of rectangular triangles. These triangular-shaped rods are then forced between a pair of vertical or horizontal matrices, to point them, and likewise a pair of cutters to separate them; and subsequently through a punching machine, by which the heads are formed.

SHOEING HORSES.

MR. W. PARRY, of Plymouth, has patented certain Improvements in Shoeing Horses, and in Horse-shoes; the object of which is to obviate the employment of nails in shoeing, and prevent horses being lamed by the nails driven awry, which often occurs even with the most skilful workman. The patentee effects this by drilling holes in the hoof to correspond with those in the shoe, and attaching the one to the other by stout wire, the ends of which are twisted and imbedded in the fullering groove or in recesses, in the bottom of the shoe. The holes in the shoe are made round, and when recesses are employed, they are filled up with iron cement. The wire should be of a diameter proportionate to the weight of the shoe, and well annealed. When the holes have been drilled, the shoes may be fixed by any unskilled person without fear of injury to the horse.

GUN-MAKING.

MESSRS. MANTON and HARRINGTON have patented certain Improvements in Priming, and in apparatus for Discharging Fire-arms. A grooved reservoir is made in the front part of the stock of the gun, to receive the percussion cap. A transversal axis is placed beneath the end of the receptacle for the ramrod, and at right angles to it. This axis carries a small lever, the long arm of which is furnished with a friction roller, which is made to press against the end of the ramrod by the action of a spring on the short arm. The axis is moreover fitted with an arm, having a pin on the inside of the free end, which takes into a slotted piece which slides up and down in a curved groove, just in front of the hammer. A pair of spring jaws is attached to the top of the sliding-pin by a pin-joint, and carries a spring piece, the top of which is opposite to the back of the jaws. When the ramrod is pushed quite to the end of its receptacle, it depresses the long arm of the small lever; and, consequently, the arm fixed on the outer

end of the axis, and connected to the slotted sliding-piece. This arm then presses upon a projection from a vertical sliding-piece, resting at bottom on a spring, and withdraws it from over the opening of the percussion-cap reservoir.

At the same time, and by the same action, the end of the jaws, which are opened by a projecting-piece, is brought opposite the mouth of the reservoir. On the gun being held in a vertical position, the cap will drop into the space between the ends of the jaws: but, on the ramrod being withdrawn, resistance to the action of the spring upon the short arm of the small lever will be removed, and the axis caused to make a partial revolution; this will have the effect, through the intervention of the outside arm and slotted sliding-piece, of moving the jaws upward, and bringing the cap, which they carry, over the nipple of the gun, when the back spring will come into action and place the cap on the nipple. The vertical sliding-piece will, by the ascent of the outside arm, be free to move over the mouth of the reservoir, and prevent any of the caps falling out. The return of the ramrod to its place, after charging, will produce the same results as first described; and, of course, cause the apparatus to retire out of the way from between the hammer and the cap upon the nipple.

SELF HEATING SHOT FOR WAR PURPOSES.

MR. FIELD, of Argyll-street, Glasgow, has invented a peculiar and apparently valuable mode of obtaining Red-hot Shot for Large Guns. It consists in the filling the hollow shot with a highly combustible powder, the composition of which has not been divulged by the inventor. Two or three fuse-holes are made in the shot, so that, when fired from the piece, ignition takes place, and the shot is made red-hot before it arrives at its destination. In a trial, the shot, which was about 2½ inches diameter, was simply laid on the ground, and the composition was ignited by a light applied to the fuse-hole. Violent combustion immediately ensued; liquid fire appeared to stream from its three fuse-holes, and the material became quite red-hot in a few seconds. The inventor states that, when fired from a gun, a red heat will be attained in less than 20 seconds from its leaving its mouth. The composition will burn under water. It is easily made, and there is little doubt as to its efficiency for war purposes, in place of the present expensive and troublesome system of heating; the shot being put into a gun in a cold state, as with ordinary solid ball.—*Glasgow Chronicle.*

NEWLY INVENTED CANNON.

WE learn from the *Pittsburg American* that a trial has been made in that city of a Newly Invented Cannon, for the purpose of testing its advantage over guns cast in the usual way. The experiment resulted in favour of the new gun, which exploded only at the 255th round;—while the other, with precisely the same charge and the same strength of reinforce, exploded at the 85th round. The inventor of the new piece is Lieut. Rodman, of the United States Army; and his improvement consists in casting the cannon hollow instead of solid, as

heretofore,—the "core" being prepared so as to enclose a continuous current of cold water, which, by a steady flow during the process of cooling, *chills*, and thereby increases the density and consequently the strength of the metal.

THE NEW PRUSSIAN MUSKET.

The German journals contain descriptions and observations concerning a newly-invented Musket which they call Zundnadel (touch-needle), and with which a great part of the Prussian army has been armed. The *Cologne Gazette* describes the invention as follows:—The name of this new musket has been given to it because the explosion is produced by a metallic blade, or needle, which is inserted into the cartridge. The bore is rifled, and the balls pointed, conic at the point, cylindrical at the centre, and round at the large end. The cartridge is provided with a layer of some explosive substance near the bullet, and the powder is placed at the bottom of the cartridge, which is introduced at the butt-end of the musket. In pulling the trigger, a fine steel blade (a needle) introduces itself by an opening in the back of the tube, traverses the cartridge and powder, and arrives at the explosive substance, which is the same as that employed for filling percussion-caps. Thus, the powder kindles at the extremity, and is consumed to the last grain. The charge of powder is the one-eighth of an ounce, whilst that for a common percussion gun is generally a quarter of an ounce. With these muskets, a soldier is able to load and fire six or eight times without letting go, and the longest range of his weapon is a thousand toises. He can take a correct aim at 800 toises; common muskets do not carry beyond 400 toises; so that the Prussian soldiers are able to open fire at double the distance of the enemy. A troop of soldiers marching at gymnastic pace (double quick time) would go over the distance in four minutes, and would have to stand during this time from twenty-five to thirty discharges. The cavalry, which passes over 800 toises in two minutes and a half, would have sustained twenty discharges. Grape-shot produces only weak results at 800 toises; therefore, gunners may be picked off and killed one by one at their guns by the Prussian soldiers.

NEW SCYTHES.

A trial has been made at Genlis (France) of a reaping machine used in the North of France, under the various names of Belgian Scythe, *sape piquet*, &c. It is of the same form as the scythe blade, though a little smaller and more curved, and is fixed with a strap to a very short handle. The reaper makes use of it with his right hand by an easy movement, causing little fatigue. He has in his left hand a hook fixed to the end of a small handle of very light wood, with which he holds the wheat while giving the cut with the *sape*. This instrument worked in the above manner by a young man, twenty-two years of age, appeared to all the farmers and intelligent labourers present to furnish great advantages over the sickle and rake scythe. It cuts as closely to the ground as may be desired, does not shake the ears, and

consequently does not cause the grain to fall out. The reaper does not want (as is the case in using the rake scythe) an assistant to follow him to pick up what is left behind: his hook performs that office with the greatest facility, and much better; it allows nothing to fall, and collects the corn into bundles of the required size with surprising regularity. It offers, in the most evident manner, a saving of hands, strength, fatigue, time, and acts better than the ordinary implements used. In raising corn beaten down, especially, labourers hitherto consumed much time and labour, and much of the produce was lost; whilst the use of this instrument offers the greatest advantages, as it works with just the same precision as though the corn were standing. —*Brussels Herald.*

NEW SAW-FILING AND SETTING MACHINE.

MESSRS. NORTON AND COTTLE, of Holme's Hole, have patented a Machine for Filing and Setting Saws; enabling the operator to whet and set the teeth of saws in such a manner that every tooth will be equal in size and length, the proportion being graduated by an index, and so adjusted as to suit the teeth of saws of every description. Saws that have been used and become useless in consequence of bad filing, can thus be re-cut, and made as valuable as new. The set is attached to the machine in such a manner that when the filing is completed no alteration is required in the adjustment of the saw to complete the setting. The inventors have found by experience that the hardest saws can be set without breaking or injuring the teeth. Saws considered in a measure useless, having passed through this machine, are said to work perfectly easy, and to perform much faster than those filed in the usual manner; whilst the teeth being all of an equal length, will not require filing as frequently. These machines, if not too expensive, we think will come into extensive use.—*New York Mechanic.*

BRICK AND TILE-MAKING MACHINE.

MR. KEAN, Saltgrass, Deptford, Sunderland, has invented a Machine for Making Bricks and Tiles; consisting of an iron cylinder, which receives the clay at the top, and passes it through a number of knives attached to a centre shaft. These act as temperers or cutters of the clay, and press it into a peculiarly formed screw, which, in turn, gives pressure to an endless chain of moulds, passing up an inclined plane; and the bricks are delivered on a table in quick succession, all ready moulded, and in a state perfectly fit for the bench. The whole of the motive power is communicated from an upright shaft in the cylinder. The machine is calculated to make twenty thousand bricks in a day, by the application of an engine of three horse power. It can be worked by any motive power, and easily removed from place to place. It is also capable of making tiles, fire-bricks, and patent fuel.

MR. COTTON'S GOLD-WEIGHING MACHINE.*

When, in June 1842, a proclamation was made, setting forth that a large portion of the gold coinage in circulation had been reduced by wear below the current weight, and ordering all persons to cut or deface such sovereigns, many complaints arose that sovereigns which were issued from one counter of the Bank were refused to be taken at another. These complaints were not only made to the Governors, but frequently found their way into the public journals. Mr. William Cotton was the Deputy-Governor at that time, and he gave the subject his earnest attention. Upon inquiry, he found there was very little reason to doubt that most of these complaints were well founded.

The Bank, therefore, at a considerable expense, re-weighed the whole stock of sovereigns, and took from it a large number, which were sold to the Government, under the terms of the proclamation, at a loss of between £3500 and £4000. These sovereigns had all been weighed singly at the time they were received, and were supposed to be all of full weight; and even the second weighing did not detect all the light, as there were numerous well-founded causes of complaint of light sovereigns having been issued from the Bank counters which were proved to have come out of this select stock. It therefore became evident that the mode of weighing the sovereigns was very defective, and that some remedy must be devised. Mr. Cotton found some of the causes of the defective weighing in the rude construction of the scales then in use, and the great variation in the weights issued by the Mint; so that in a dozen new weights hardly two could be found sufficiently near to each other for practical purposes. Other errors were traced to arise from the want of attention in the weigher, the natural consequence of the monotony of the employment; while the constant watching of the indicator of the scales seriously affected his eyesight.

The moisture of the air often affected the operation by causing the scales to stick to the table; and a current of air acting unequally upon the scales frequently prevented a very correct weighing when the sovereign was near the current weight. The diminution of the weight of one of the scales, by the placing and displacing of the sovereigns, rendered a frequent adjustment necessary, and was often a cause of error.

Most of the above causes of error, and many others, which it seemed at one time almost impossible to remove, were effectually obviated by Mr. Cotton's invention.

The machines were first used in January, 1844, and since then have weighed upwards of 48,000,000 of pieces, and during the whole time not a single charge of incorrect weighing has been substantiated against them. When they were first used, many complaints were made by bankers that sovereigns which were standard in their scales were rejected by the machines, and returned to them cut; but

* From a Statement laid by Mr. William Miller, Weighing Clerk in the Bank of England, before the Royal Mint Commission.

in all those cases, upon reference to a very fine assay beam, it was found that the machines were correct. These complaints have, for a long time, altogether ceased; as the bankers, who send the largest quantities of sovereigns into the Bank, know well by experience that the errors of the machines, if there are any, are beyond detection by their scales, and are of so minute an amount as to be practically of no importance.

Some few sovereigns are still weighed as they are received from the public by the common scales; but such are never re-issued by the Bank until they have passed through the machines, which extract from them between one and two per cent. light. The Bank sustains the loss upon these unavoidable errors, in preference to the loss of time, the trouble, and vexation, which the re-issues of the sovereigns as they were received would occasion both to the public and to the clerks of the Bank.

There is but little wear in the machines, as the motion is very inconsiderable, and the power required to drive them only a few pounds. They weigh quite as well now as they did at first. Each machine will weigh about thirty-three sovereigns per minute: the Bank has now in use six machines, five for sovereigns, and one for half-sovereigns, which have weighed 60,000 per day.

In the course of his subsequent evidence, Mr. Miller stated, in reply to the question,—What is the difference in the weight of a standard and a current sovereign?—The pound troy being equal to £46. 14s. 6d., the standard weight of one sovereign is nearly 123·274 grains, and the lowest weight at which a sovereign is current by law being 122½ grains, the difference is nearly ·774 grains.

The remedy stated in the Mint Indenture being 12 grains in one pound troy, how much in decimals of a grain is this if applied equally to each sovereign?—Nearly ·257.

MECHANICAL LEECHES.

THIS is the invention of M. Alexandre, of Paris. The main qualities of the new Annelidæ are two: they bite always, and never die. In short, they are nothing more nor less than two little tubes, a sucking and a scarifying one—the former in glass, the latter in copper—destined to imitate the two acts of the leech. It would, however, be more correct to denominate them "tubular cupping-glasses," for such they are in reality. The Academy of Medicine has reported favourably of them, saying, "The instrument is a very useful one, and may replace leeches with advantage in the great majority of cases." The French Ministers of War and Marine, and the directors of the different hospitals, both civil and military, have ordered these leeches to be employed in the different establishments under their control.

A ONE-WHEELED CARRIAGE.

A ONE-WHEELED Coach has been tried in America, and promises to be of much value, especially on prairies, or wherever the surface of *the ground* is tolerably level. The vehicle consists of a large hollow

l 14 feet in diameter, and 6 feet wide. The horses are , and propel it along in the same manner that a caged s its wheel revolve. Slabs are nailed on the inside floor by which the horses obtain foot-hold. In the centre is shaft, from which suspend hangers, which support four ofas for passengers: the wheel thus revolves freely, the ıg in perfect equilibrium. The arrangement for guiding s very simple and effective; it can make a much shorter age coach. A successful trial of one of these carriages le on the State Road, between Canal Dover and Tusty, Ohio, which perfectly demonstrated their utility in very heavy loads with ease and rapidity. The carriage a party of twenty-four persons, with two heavy reviously trained to propel them. The distance between s, five miles, was performed in twenty-eight minutes on and twenty-five minutes on the second. The horses are by harness; they travel, as it were, on an endless plank r work is comparatively easy.—*Boston Chronotype.*

SWEEPING MACADAMIZED ROADS.

SMITH, in a paper read to the British Association, obeping is the only mode of cleansing that should be allowed, ets or on turnpike roads. Sweeping by the wide brooms vorth's machine is preferable to all other modes of cleans-

It must be evident, that the fact of these wide brooms gitudinally, with a pressure that can be adjusted accordnstances, tends powerfully to preserve the road, and to s surface. They press most upon the ridges, and least lows, thus tending to reduce the former, and fill up the n the dirt is stiff, and adheres firmly to the stones, it e well watered, when it may be completely removed by without disturbing the crust, leaving the surface firm and ie use of water for this purpose has been objected to by ies, on the ground that it removes the useful grit; ary has been proved by ample experience. The use of machines, with the proper employment of water, has reount of material required for the repair of roads in Bire-third—namely, from about 20,000 to 13,000 cubic irst-named amount is the average for seven years preceduction of the machines,—the latter, of the three years sube following is the result of an experiment, to settle wheit was or was not removed by water and machine sweepe 22d of March last, the Quadrant, Regent Street, was a thick layer of dirt, which caused great annoyance ury to the road, but could not be removed by scraping, ving also much of the new stone, to which it adhered. It ed to sweep half of it dry, and half after proper watering. ie, and the sweepings removed were washed, to separate *m the stony matter* mingled with it. One-third part of

that which was taken dry, consisted of coarse grit, which would have useful on the road, whilst one-twelfth part only of that which wa moved in the form of slop was stony matter; and that was so pletely pulverized as to be of scarcely any use,—it had done its After the two portions of the road had been cleansed, the diffe between them was very striking. That which was swept dry wa covered with adhesive matter, which was lifted by the wheels, tog with the stones to which it adhered, the whole road being roug uneven; the portion which had been swept with water was per even and smooth. On the 24th, both portions were swept, but one quarter as much dirt was taken from that which had been w swept as from the other. On the 26th it rained, and three tim much slop was taken off the part of the road which had not been w swept on the 22d. The preservative effect of water machine swe was most evident by the decidedly better condition of the portion road cleansed in this effective manner. The great objection against macadamized roads for streets is the annoyance by dus dirt which they occasion, and many persons prefer submitting deafening noise of pavement in order to avoid these; but such not be the case if water and machine-cleansing was adopted, th of which would be saved in diminished wear and tear. The expense of cleansing and watering Birmingham is about £500 annum,—or less than one penny per week for each of its inhabita *Athenæum*, No. 1142.

HARRISON'S PATENT BISCUIT BAKING MACHINERY.

If our forefathers (says the *Liverpool Mail*) had been told before they had lain long in their graves, a machine would b vented by which flour and water could be mixed together at one and brought out at the other in the form of ready baked biscuits would have doubted the sanity of the person addressing them. strange as it may seem, this is a task now in operation every wor day at the extensive ship-bread bakery of Mr. Thomas Har Mersey Street, Liverpool, late of Wapping. Various machine now employed for the baking of ship and other biscuits; but th patented by Mr. Harrison differs from those hitherto in use, in si utility, and in adaptation for the firing of the bread, of the h principle, now the property of the Patent Desiccating Company. flour and water in proper proportions are placed in a cylinder the first operation of thoroughly mixing is performed by arms i On leaving the cylinder, the dough is kneaded by means of a iron cylinder, under which it is passed several times. The req thickness is attained on passing beneath a smaller cylinder. The do spread like a large sheet, passes along an endless cloth, the mach moving at each stroke the precise width of a biscuit. As the d passes along, by the rising and falling of a nicely-adjusted piec mechanism, the biscuits are cut into shape, and receive the stan the patentee. The biscuits are not circular, but six-sided: th fore, there is not, in cutting out, any waste of dough, except a s

portion at each end. Passing along the endless cloth, the biscuits are conducted to the mouth of the oven, where they are received on what may be called, for familiar illustration, an endless gridiron, which, as the machine moves, draws in the biscuits in a few seconds. Each oven is 4½ feet in width, and 26½ feet in length. There are four ovens, one above another, and all fed from the same furnace with hot water. The mixing of the flour and water occupies about twelve minutes, the kneading five or six, and the firing half an hour. As each oven contains 650 biscuits, and may be filled within a few minutes of its neighbour, there is no difficulty in producing from flour and water no fewer than 2600 biscuits in an hour, or nearly a ton of ship biscuits every two hours. The biscuits, too, are of excellent quality—crisp and sweet. Messrs. W. and M. Scott, of the Tranmere Foundry, are the manufacturers of the machinery.

Details of this invention, with diagrams, are given in the *Mechanics' Magazine*, No. 1369.

ELASTIC MOULDS.

At the Sheffield School of Design, Mr. Y. Mitchell, the master, has given a lecture, illustrated by experiments, on the art of making Elastic Moulds. It has great advantages over the old plan. The moulds may be made at small cost, and with great rapidity. That which would occupy five or six days in the modelling may be furnished by this process in half that number of hours. By the facility thus afforded, beautiful forms may be multiplied so cheaply as to be brought within the reach of all. The principal material used for the elastic moulds is glue or gelatine. The best fish glue will answer as well as gelatine, and is much cheaper. The material is dissolved like glue, in a vessel placed over the fire in a pot of hot water, stirring it during the process. To each pound of the gelatine it is necessary to add three-quarters of a pint of water, and half an ounce of bees' wax. It is ready for use when about the thickness of syrup. The model must be oiled carefully with sweet oil, and the composition must be poured upon it while warm, but not boiling. Having set, it may be taken off the model. When the model is small, it should be placed in a shoe or case, which gives facility for shaking the mould well when the plaster is poured, so as to drive it well into the crevices. The plaster should be fine; and in order that it may harden and set quickly, about half an ounce of alum should be added to each pint of water used in mixing it. Before using the mould, it should be carefully oiled. Great care is required in mixing the plaster, and watching it when in the mould; for if it be allowed to remain long enough to heat, the mould will be destroyed. Mr. Mitchell exhibited moulds, and casts were taken from them in the presence of the audience. He also showed a specimen of stearine, and explained how casts may be made of it with a shining and wax-like appearance.—*Sheffield and Rotherham Independent.*

MANUFACTURE OF SUGAR.

A PAPER has been read to the British Association, on the combined use of the Basic Acetates of Lead and Sulphurous Acid, in the Colonial Manufacture, and the Refining of Sugar; by Dr. Scoffern.

Dr. Scoffern, after a few preliminary remarks on the anomalies which beset the colonial sugar-manufacturing functions, stated the actual amount of pure white and crystallizable sugar existing in the sugar-cane juice to be from 17 to 23 per cent., and the amount of juice contained in the cane to be about 90 per cent.; of this amount only 60 per cent. on an average is extracted; and of this quantity only one-third part of its sugar is obtained, in a dark impure condition, instead of white and pure, as it might be extracted. The operation at present generally followed in the colonial production of sugar involved the use of lime,—an agent which although beneficial in separating certain impurities, and decomposing others, effects both these agencies at the expense of two-thirds of the original sugar. Curious plans had been followed to avoid the use of lime; alumina, in its hydrated condition, had been employed, but with inconsiderable success. As a purifying agent, the basic acetate of lead was known to be most potent, but could not be generally employed, owing to the existence of no sufficient means of separating any excess of that agent which might remain. Dr. Scoffern effects this separation by means of sulphurous acid forced by mechanical means into the sugar solutions. The process had been used for more than twelve months in one of the large British refineries, and a lump of sugar prepared by means of the operation was exhibited. The advantages presented by this operation were thus summed up:—1. As applied to cane-juice, and other natural juices containing sugar, it enables the whole of the latter to be extracted instead of one-third, as is now the case; and in the condition of perfect whiteness, if desired, without the employment of animal charcoal. Owing to the complete separation of impurities, the juice throws up no scum when boiled, and therefore involves no labour of skimming. Finally, the process of curing is effected in less than one-third of the present time; and the quality of the sugar being in all cases so pure and dry, no loss in weight occurs during the voyage home. 2. As applied to the refinery operation, it enables the manufacturer to work upon staples of such impurity that he could not use them on the old process. It yields from these staples a produce equal in quality to the best refined sugars produced heretofore—in larger quantity, and in less time. It banishes the operation of scum-pressing, the employment of blood and lime. Finally, its cost is even less than that of the present refinery process.

Messrs. Oxland, Plymouth, chemists, have patented certain improvements in the Manufacture of Sugar, confined to the defecation and decolourization of the Sugar, and consisting in employing for the purpose acetate of alumina. The mode of operation which they prefer is as follows:—The sugar is dissolved in water, and heated to 210° Fah. by steam flowing through a flat coil of pipes. Carbonate of lime is mixed with this saccharine solution, to destroy the acidity;

after which it is run through filter bags into a shallower blow-up pan than was first used, where it is mixed with acetate of alumina, and boiled until nearly the whole of the acid is evolved, which can be ascertained by testing the steam with blue litmus paper. The pan is fitted with an air-tight cover and pipe for conveying the acid fumes to a condenser, whereby they may again be rendered available for the manufacture of acetate of alumina; whatever quantity of acid may remain in the syrup after the evaporating process, is neutralized by the admixture of carbonate of lime. Cane and beet-root juice may be defecated by this process, either before or after concentration, and clarified by the employment of albumen, bullock's blood, or other well-known agent, in the usual way. The acetate of alumina is prepared by mixing with a solution of sulphate of alumina a solution of soda-ash, so as to produce an alkaline reaction on reddened litmus paper. The mixture is allowed to precipitate, and the clear liquid is decanted off. The precipitate is removed and washed repeatedly with water, until the hydrometer fails to indicate the presence of any soluble matter; the acid is then added in sufficient quantity, but not in excess, to form the acetate of alumina. The solution of tannin is composed of crushed valonia, in water. The quantity of acetate which the patentees employ for one ton of average sugar is four pounds.

VARNISH MAKING.

Mr. Castley, of Harpenden, Hertford, has patented certain improvements in the manufacture of Varnishes from resinous substances. This invention consists—

1. In manufacturing in manner following, from resin spirit, and the gum resin called gutta percha or gutta tuban, a new compound or varnish, which possesses the properties of being strongly adhesive and perfectly water repellant. The patentee puts into a pot three parts, by weight, of the gutta percha or gutta tuban, as imported, or as it may be bought in the home market; he adds nine parts of crude rosin spirit (obtained by the destructive distillation of common rosin), and subjects them to a heat of from 120° to 140° Fahrenheit, stirring the mixture occasionally. The resulting solution forms a varnish which answers well for the coating of all coarse fabrics, such as tarpauling, rick-cloths, &c.; but to obtain a varnish of a purer and better quality, suitable for fine articles, is substituted in the preceding process, for the crude rosin spirit, a rectified rosin spirit, which is obtained by passing a current of steam through the crude rosin spirit, until the condensed product which comes over exhibits a specific gravity of about 6·870, at which point the process of distillation must be stopped, all products of a higher specific gravity being injurious to the quality of the spirit.

2. The invention consists in manufacturing a colourless varnish, in manner following, from gum damar and rosin spirit, or from gum mastic and rosin spirit. The inventor first takes rosin spirit which has been rectified by steam, as before described, and mixes with it from one-tenth *to one-sixth its weight of* sulphuric acid, of not less specific gra-

vity than 1·700; he agitates the mixture well, after which he rectifies the spirit over again by means of a current of steam, as before, when the spirit comes again in a colourless state; and finally, dissolves the gum damar or gum mastic in about four times its weight of this purified rectified spirit with the aid of a gentle heat. A varnish of an inferior sort may be obtained by using rosin spirit which has undergone one process of rectification only, and not been treated with the sulphuric acid.

STELLING'S PROCESS OF MAKING AMBER VARNISH.

In manufacturing Amber Varnish, according to Mr. Stelling's method, the amber (which has to be submitted to high temperature to melt it) is introduced into a stout copper vessel, which is closed at top and luted with clay. This vessel is furnished at its lower end with a funnel-shaped vent, which carries a perforated sheet of iron or sieve, sufficiently fine to prevent the escape with the melted amber of any impurities which might be contained in the amber. This vessel is introduced into a large chafing-dish fixed upon a high stand, and its tapering bottom projects through a hole in the bottom of the chafing-dish, and extends a few inches downwards. When the vessel is thus adjusted, the chafing-dish is nearly filled with coal, and lighted. The fuel is, by the peculiar form of the chafing-dish, prevented from dropping into the oil-vessel, to be presently described, and thereby soiling the liquid.

The heat from the ignited fuel very soon heats the vessel to such a temperature as will melt the amber, and cause it to flow through the perforated metal or sieve above mentioned, in passing through which it will be purified from all extraneous matters. The melted amber runs into a copper vessel which is placed below the chafing-dish, and is provided with a long handle. This vessel or receiver is filled about two-thirds full with the oil from which it is intended to prepare the varnish, and is placed upon an ordinary chafing dish charged with incandescent fuel, which heats the amber to such a temperature as to cause it to become incorporated with the oil. When this is completely effected, the vessel is cleansed for a fresh operation, and the other ingredients necessary for the manufacture of the varnish are added to the mixture of oil and amber, as soon as it has cooled down to a suitable temperature.

This very simple means presents the following important advantages over those now in use for the manufacture of varnishes:—

1st. The amber melts completely without any residuum; and as it is contained in a perfectly tight vessel, nothing, or next to nothing, is lost by the evaporation of its constituent parts.

2nd. The application of a high temperature effects the fusion with ease and rapidity.

3rd. This mode of preparing varnishes is perfectly free from danger as regards fire. The amber is contained in a perfectly close vessel and cannot, therefore, take fire, especially as the air has no access through the spout through which the melted amber flows. Nei

will the oil through which the melted amber flows be liable to take fire, for it does not require to be heated to a very high temperature, as is at present the practice,—the amber being now melted and dissolved in oil heated to the point of violent ebullition ; and further, the chafing-dish is small, and it is impossible it can communicate to the vessel filled with oil (which is of much more considerable capacity) sufficient heat to cause fear of fire.

4th. All the vessels are of stout copper, and consequently are not liable to burst, as is the case with the earthen ones, which are at present too often employed.

It will thus be seen that, independently of the practical advantages which this method of manufacturing varnish (and which has already stood the test of long experience) possesses over those ordinarily in use, it has the important one of being unattended with danger.—*The Technologiste ; translated in the London Journal.*

DISTILLATION OF SEA-WATER.

In June last, three of Her Majesty's ships—the *Arrogant*, 46, Captain Fitzroy; the *Plumper*, 11, Commander Nolloth ; and the *Reynard*, 11, Commander Cracroft—sailed from Portsmouth, furnished with the Government distilling and cooking galley, constructed by Mr. Grant. By the improvements made since the introduction of the galleys into the naval service, the quantity of fresh water obtained by the distillation of Salt Water during the period it is required to keep the fires alight in the galley for the purpose of cooking, will, on the average, supply each individual on board the vessels with one gallon of distilled water every day ! The latter kind of water continues to be preferred for drinking and culinary purposes to the water usually supplied to ships ; it passes immediately from the condenser into the water tanks at the same temperature as the surrounding ocean. In these tanks, it becomes perfectly aerated, losing altogether the vapid flavour common to all distilled water in the course of a few hours, without the aid of chemical preparation or mechanical arrangement, by the simple fact of the action imparted to the fluid by the motion of the ship when at sea. A series of interesting and important experiments have been made on board the Illustrious, 72, by Mr. Crosse, with the view of imparting at the moment of distillation the oxygen of which the water is deprived in the process, and giving to it that briskness which is found in spring water. This is effected by passing a proportionate current of electricity through the particles of water by means of an extremely simple and self-acting apparatus. The results of the experiments made have been highly satisfactory. The only point to be determined is, whether any artificial means, either chemical or mechanical, are required for aerating distilled water on board ship, as it is found that such water becomes sufficiently aerated in the course of a few hours by the motion imparted to it by the ship ; but if the distilled water be required for immediate use, Mr. Crosse's application produces the object desired most effectually.—Times.

VENTILATING WATER-WHEEL.

A PAPER has been read to the Institution of Civil En titled "A Description of the Improved Forms of Water-V Mr. William Fairbairn. After noticing the opportunity f ment afforded by the substitution of cast and wrought iror in the construction of hydraulic machines, the author poir disadvantages and loss of power attending the principle ar of the old water-wheels. He quoted Dr. Robinson's " Philosophy" for the numerous disadvantages of the old forn and the difficulties arising from the attempts of the old to design a shape which should retain the water for a gr of time in it, and thus give out more power. The chi was the opposition of the air to the entrance of the wate merous contrivances—such as boring holes in the starts, spout much narrower than the face of the bucket, &c.,— But still the difficulties existed; and they induced Mr. F adopt the construction described in the paper, and whicl "the Ventilating Water-Wheel." The general object of fications was to prevent th condensation of the air, and t escape during the filling of the bucket, as also its re-admis the discharge of the water into the lower mill-race.

NEW WATER WORKS AT YORK.

THE Water is pumped up from the river Ouse, at Ac (about six miles from the city), by two steam engines of power each. Each engine is connected with two pump raising the water into the subsiding reservoirs, and th pumping it, after filtration, into the high service reser engine, however, works but one pump at a time; the pun arranged, that while one engine is working the low lift to t reservoirs, the other is raising the filtered water to the hig This arrangement being in duplicate, of course gives eacl command of the whole system; so that, in case of accide the necessary repairs are to be made, the supply of wate can be performed without fear of interruption. The w taken into two subsiding beds capable of holding two and a l of gallons, where a portion of the impurities held in mechan sion subside; and then it flows into the filter beds, to re purification, by passing through the filtering medium t water well, whence it is pumped up to the high servic The filter beds are three in number, each being complete i capable of filtering 800,000 gallons of water in twenty- The ordinary method of application will be to work two filtering, while the third is being cleansed, or at rest. Th composed of layers of sand and gravel, so disposed that t the sand is on the surface, and the coarsest gravel at the b intermediate thickness being made up of materials getti coarser from the fines and downwards. In the lowest coarse gravel, collecting drains, 18 inches in diameter

whole length of the filters, and communicating with these are ·of subordinate cross-drains of smaller diameters. In con- the drains, openings are left at regular intervals, to allow :d water to pass freely to the inside, by which means the scending through the layers of sand and gravel is collected rains, and conveyed to the filtered water well ready for use. ess of cleansing the surface of the filter is easily performed. is the deposit of the arrested matter prevents the free passage ater through the sand, the use of the filter is suspended, and e drained dry; the residue, together with a very slight film which has become contaminated, being then removed, the is again in perfect condition, and ready for use. From the er well a continual stream of filtered water is forced into a rice reservoir, at Severus Hill, which is about 120 feet above Ouse, at Acomb Landing, and nearly on a level with the roof ntre aisle of the nave of the Minster; a constant supply of it water is, therefore, always at hand, and ready to flow by its ity to the highest houses in York.

SUPPLY OF LONDON WITH WATER.

s no exaggeration to affirm," says Mr. Simon, the medical health to the city of London, "that the unrestricted supply of the first essential of decency, of comfort, and of health; that ation of the poorer classes can exist without it; and that any n to its use in the metropolis is a barrier, which must main- isands in a state of the most unwholesome filth and degrada-

netropolis, it is notorious, is ill-supplied, generally; whilst ls of the population have no regular supply whatever. It is the *Builder*, No. 355, that—"The connection between dis- bad water is established beyond cavil: the effect which the ation of wells had in producing cholera in many places, is yond the shadow of a doubt. The high rate of mortality on side of the Thames may be ascribed mainly to the fact, that -works for that part of London draw their supply from a e Thames horridly polluted by sewers, and that many of the ells are made poisonous by the cess-pools, which are nearly as e wells, and often close to them."

eral agitation upon the subject has given rise to great specu- o the best means of Supplying London with Pure Water. For se there are half-a-dozen schemes; without saying anything plications by the New River Company, the Kent Water nd the Lambeth Water Works Company, for extended

mpany proposes to supply London from the Thames at a *Mapledurham Lock*, county of Oxford, with reservoirs at *.*

hames Chalk Filtered Company" desires "to divert a por- *water of the river* Thames from its present channel; to

convey it by aqueducts to shafts sunk on the bank of the river, into the chalk stratum of the London Basin; and to form such shafts, with accompanying shafts, and other necessary works, into filters for purifying, by means of the chalk, the Thames water so conveyed."

The "London Spring Water Company" is projected "for the purpose of procuring a supply of water pure from the chalk formation, by means of shafts to be sunk in the neighbourhood of Watford; which water is proposed to be lifted into reservoirs on Stanmore Common, to the respective heights of 400 and 490 feet above the Trinity high-water mark at London Bridge, and brought to London and the suburbs in capacious pipes along the Edgeware Road."

And the intention of "The Henley-on-Thames and London Aqueduct Company" is shown in their name. They propose the appointment of Commissioners, to whom the execution of the Act, when obtained, is to be entrusted: to have five reservoirs around the metropolis; and to buy up existing Water Companies.

"Mr. Martin's plan for the improvement of London, which has been before the public for some years, embraces, first, a new mode of dealing with the sewerage of the metropolis—provided for a more copious and constant supply of fresh water for culinary and domestic uses—for cleansing the Serpentine and other ornamental waters in the parks and gardens of the west-end—for improving the navigation of the Thames; and for the erection of public promenades on both sides of the river—as in Paris—from Chelsea and Battersea to Limehouse and Rotherhithe. In connexion with these vast changes are numerous minor details—widening of streets, opening up of new outlets into the great life streams, building of bridges, and so forth. The artist deals with the map of London as he would do with so much canvas. His sketch has the breadth and novelty of one of his own pictures. Yet his plan has received the sanction of the Society of British Architects; and practical engineers have confidence in the possibility of carrying it out generally with ultimate advantage to the purse as well as to the health and beauty of the metropolis. A Company, we believe, was formed at the time for carrying the project into effect, which has taken the matter, for a proper consideration, out of the hands of its conceiver. Our attention is recalled to the subject by the re-issue of the Report of the Committee, accompanied by a lithographed sheet of the London district; exhibiting at a glance all the various improvements proposed in the original programme, with the addition of a new network of railways joining all the great trunk lines together, and debouching on the proposed quays and wharfs on the river bank at numerous points. Could such a scheme be realized, London might become the most beautiful and salubrious capital in Europe.—*Abridged from the Athenæum*, No. 1229.

ARTESIAN WELLS

The Very Rev. Dr. Buckland, Dean of Westminster, in a paper *read by him to* the Institute of British Architects, observes: in his

ater Treatise, which was published thirteen years ago, vritten a chapter on the subject of Artesian Wells; and he y that the result of his observations in England had been :onfirmed by the practical experience of some of the most scientific men in Germany and France, including M. Arago. :en asserted that sufficient water might be obtained in this is, by Artesian wells, to afford an ample supply to ten such London; but he would venture to affirm, that though there n 250 to 300 so-called Artesian wells in the metropolis, there ›ne real Artesian well within three miles of St. Paul's. An well was a well that was always overflowing, either from its ource, or from an artificial tube; and when the overflowing was no longer an Artesian well. Twenty or thirty years ago, e many Artesian wells in the neighbourhood of the metropolis: n the gardens of the Horticultural Society, in the gardens of ›p of London at Fulham, and in Brentford and its vicinity; rells which were now made by boring through the London : merely common wells. He had heard it said that Artesian ght be made in any part of London, because there was a water which would rise of its own accord; but he could h regard to the water obtained to supply the fountains in Square, that it did not rise within forty feet of the surface; umped up by means of a steam-engine, and the requisite water could be obtained at a much less cost from the Chelsea ks. Indeed, the same water was pumped up, over and over No less than £18,000 had been spent upon an Artesian well 1 been made on Southampton Common, but the water never within eighty feet of the surface, and never would rise any The supply of water formerly obtained from the so-called wells in London had been greatly diminished by the sinking rells. Many of the large brewers in the metropolis who water from these wells had been greatly inconvenienced by e of the supply; and he had received a letter from a gentle- iected with a brewer's establishment, stating that the water rell was now 188 feet below the surface, while a short time d to rise to within 95 feet of the surface. Indeed, the large vere actually on the point of bankruptcy with regard to a water. There were, as he had said, more than 250 Artesian sely so called, in London, one-half of which had broken nd those from which water was obtained were only kept in an enormous expense. The average depth at which water w be obtained from so-called Artesian wells in London was :low the Trinity House watermark; and he believed that in twenty-five years more, water would not be obtained at a than 120 feet. This was, as he had said, a subject of vast :e to the inhabitants of the metropolis, who had not now a water equal to one-fourth of what was required for their use.

verend Doctor, after going into a lengthy and elaborate

geological description of the soil in the metropolis and the nei ing districts, illustrating his observations with well-execut interesting plans and sections, proceeded to inquire by what sufficient supply of water could be obtained for the inhabitant metropolis? He considered that an ample supply might be from the Thames in the neighbourhood of Henley, after th had been fed by the Loddon, the Kennett, and other tributary The water might be conveyed to London by an open aqu sufficient depth parallel with the Great Western Railway; a should have a fall of three feet, it would flow without the aid engineering works, and might be brought to a reservoir in tl north of Paddington. It would there be at a level of 105 fe high water mark, and at that level two-thirds of the inhab London might, by means of an engine, be supplied with high pressure. The reverend gentleman concluded by sayi upon careful consideration, this plan appeared to him the mos that had yet been suggested for affording to all the inhabitant metropolis an abundaut supply of pure water; and his views received by the meeting.

NEW WATER FILTER.

A NEW description of Filter, adapted for the perfect filt Water, for the supply of towns, or for any other purpose whe quantity of pure water is required, has been invented b T. and W. Stirling, Bow Bridge Slate Works, Stratfor The objects and advantages of this apparatus are state 1. While it is capable of being so combined as to filter la tities of water, it also acts upon each gallon that passes with minuteness and delicacy as the chemist employs for his mo operations. 2. It is made of a material upon which wat decomposing effect. 3. While it may be readily cleaned, it degree liable to get out of order. 4. It occupies but a sm compared with the quantity of water filtered by it; and 5 arranged as to be guarded from the disturbing effects of fro and protected from soot, smoke, and dust. A series of sla or cisterns, the size and number of which are regulate quantity of water required to be filtered, are so placed that voir, or pipe, from which they are supplied shall have a hea of about 2 feet 6 inches. The water passing along the r enters each filter at the bottom through a branch pipe, a through three strata of filtering medium (the lowest of wl upon a hollow basis, across which a fine wire gauze is s through which it rises to the top of the filter in a perf state. The filtered water then passes from the top of e through a small pipe into a slate channel, along which it run pipe, reservoir, or other receptacle for the filtered water. Th medium consists of three strata of incorrodible mineral su the chamber in which they are placed, admits the introd a *hair brush*, such as is used for cleaning bottles, and with

of the filter bed is readily cleaned of all residuum in a few s. The apparatus can be adapted to filter any quantity of rom 500 to 50,000,000 gallons, and may be applied not only estic use, but to the purposes of paper-makers, brewers, dis-chemists, bleachers, wool-staplers, printers, and other trades ch large quantities of pure water are indispensable. The ethod of filtering water supplied to towns is by means of rs of subsidence and filter beds, which occupy a large space of and at the best effect the object very imperfectly. This us, however, can be so managed as to occupy only about-one th part of the space required by the other methods now in use, y be enclosed in a covered building, so as to protect it from ot, and dust; and, when necessary, warmed by flues to prevent on of the filters from being impeded during severe frost.

CHEAP FILTER.

RY simple means exists, by which any poor family may Filter vater required, viz., by using a large pan or tub as the tank, ring the water (by ascension) through a sponge stuffed into in the bottom of flower-pots, using two pots, the lower one lf filled with charcoal, and loosely covered with thin flannel, er one placed in it so as to sink the flannel with it, and then by a string: nothing can be more simple, or more easily l.—*Dr. W. Ord.*

HORMAN'S PATENT CISTERN.

invention has been introduced to the British Association as a machine, by Mr. W. Wood. The Cistern is so contrived that e caused, by a self-acting valve, to discharge a periodical flow through the drains of the house, which, combining with a simultaneous discharge from the other houses, would sweep ers clear every three or four days or more, as may be found e.

s observed by Sir W. Snow Harris, in the discussion which l, that the best action for effecting the purpose was, in fact, a e imitation of what nature effects by a deluge of rain; and h a thorough cleansing of sewers once or twice a week, ope-directly upon the drains of each house, is a sanitary process of best possible public value, and ought not to be overlooked. inary sluicing by reservoirs could possibly attain the perfect result to be derived from a general use of such an apparatus tructed; and which, upon public grounds, should be caused to ied to all houses, provision being made for a regular supply of which would certainly be effected eventually.

THE COLLECTION OF ANIMAL REFUSE OF TOWNS.

AYRES has read to the Society of Arts, a paper on the Im-

portance of the Animal Refuse of Towns as a Manur Methods of rendering it available to Agricultural Purp author commenced his contribution by calling attention to th of preserving the animal refuse of towns, and the importan attached to it in China and Flanders, in many departments Tuscany, &c.; and also to the various forms in which it is the earth.

Having alluded to the importance of this subject in with the improvement of the sanitary condition of towr injurious effects upon the inhabitants of London in par allowing the putrid matter to be carried into the Thames, t tossed upon the waves, and left exposed upon the shor retrocession of the tide, Dr. Ayres considered the cont cesspools of London alone, which he has calculated canno than 46,500 tons of perfectly dry matter annually— according to the analysis of Liebig, sufficient to fertilize million acres of land, and the monetary value of which cann at less than £340,000. Having next alluded to the plans hitherto been proposed for drying and rendering this gre matter portable and available for agricultural purposes, h to describe a plan which he has recently patented for desirable an object.

My process (he observed) essentially depends on the fa the gaseous and volatile products of putrefaction are comb are resolved into the ordinary products of combustion w over any incandescent surface, or over or through burnin mixed with atmospheric air. Thus, ammonia is resolved i and water; sulphuretted hydrogen into sulphurous acid carburetted hydrogen into carbonic acid and water; ph hydrogen into phosphorous acid and water; the vola masses associated with the gases are completely destroyed acid alone passes through the fire unchanged. All these the exception of ammonia and carbonic acid, exist only i proportions in putrescent animal matter. It follows, fro been stated, that all the volatile products of putrefacti resolvable into the ordinary products of combustion, wh known to be innocuous. It suffices to conduct these gases through a fire to effect their entire decomposition and dest

The apparatus by which this process may be worked susceptible of many modifications; but that to which Dr. ticularly desired to direct the attention of the Society drying the animal refuse by the application of heat, eit from steam pipes or otherwise; and at the same time des volatile products of putrefaction by burning them.—*Build*

LIQUID MANURE DISTRIBUTORS.

SOME interesting experiments in Irrigation have been Metropolitan Sewage Company's Works, Stanley Bridge,

The plan by which the Company proposes, in the first

pply the sewage manure of the metropolis, and Thames water, for e purposes of irrigation, is to drive a pipe in connection with their orks through every acre of land, in the centre of which they would ace one of Bateman's patent fire-cocks. This invention was exhibited, and is especially worthy of notice. It is available for all the numerous offices of stop-cocks generally; and, from its suitability for high-pressure purposes, would appear to be peculiarly adapted as a substitute for the ordinary fire-plug. The great peculiarity of the invention is, that the valve consists of a round ball of wood covered with India-rubber, which hermetically seals the orifice when the water s turned on at high-pressure; and, on being forced down by a screw, egulates the supply from the smallest dribble to the most impetuous urrent. To this valve boss, as the patentee calls it, is attached an pright pillar with arms, and an instrument very much in the shape f a common fire-shovel, which has been registered under the title of "Distributor."

The first experiment tried was with a supply of water from the e-cock—high-pressure having been put on at the station. The ater was passed through hose with a distributor attached, and was read over a breadth of sixteen feet by two men. This is called the anchester plan, but it seems open to many objections. The hose ags on the land, and the waste of power and increase of manual our would prevent its being generally adopted with advantage.

Mr. Coode's patent irrigator was next tried, by a large model about -thirds the full size. Its construction is extremely simple, consing essentially of a long conical cylinder of from seven to ten yards ength, on wheels, and easily removed at a walking pace by a stout . This tube is perforated, and delivers liquid through its whole gth. As it moves along, the hose by which the cylinder is fed, by ingenious contrivance, is continuously supplying the implement h as much liquid as it can distribute. The implement delivers the iid with perfect equality without violence; a great advantage when ng liquid manures are used, or seeds and feeble plants are to be ered or manured. The required water power for working it might procured from a common pump, and is such that every farmer or dener might command. At the end of every thirty-six yards the lement has to be coupled afresh to the main hose by which it is plied. The arrangements for doing this were evidently defective, the principle was very apparent. By means of this implement, n 14,000 to 20,000 square yards may be irrigated within the hour. Next came the experiments from the fire-cock and distributor. e water being turned on at high pressure, the distributor irrigated, a fertilizing shower of rain, a circle of about eighty feet in meter. Hose was then screwed to the pillar, and conveyed a tance of eighty yards, and attached to a moveable tripod, conucted for the purpose, from whence the process of irrigation was eated. By means of these moveable tripods, an acre of land may constantly watered and irrigated from one stationary cock, with a derate length *of hose. It is* calculated that one man might move

the pipes, valves, &c., and irrigate one acre of ground within t
hour. This is the plan sanctioned by the Company.

The experiments were watched with deep interest, and appeared t
give great satisfaction.—*Morning Chronicle.*

DRAINAGE LEVELS OF LONDON.

Mr. Wyld, of Charing-cross, has published a Map of Lond
and its vicinity compiled from the Levels made by order of the Com-
missioners of Sewers for the purpose of Draining the Metropo
The map is in four sheets: it is laid down on the scale of three inch
five-eighths to a mile, and it comprehends a square bounded by Sy-
denham and Norwood on the south, Blackheath Park on the east
Crouch End and Walthamstow on the north, and Twyford on th
west. The levels are taken on the mean water at Liverpool, which
stated to be 12½ feet below high water mark in the Thames. It w
surprise the public to observe the facts deducible from these map
in respect of the altitudes of the different parts of London. Th
lowest points of the metropolis are Camberwell Common, the Surr
Zoological Gardens, and the districts adjacent—indeed, the whole
that part of London known as Lambeth. The elevation is from eigh
to sixteen feet below the level of mean water at Liverpool, or betwe
four and ten feet below Trinity high-water mark in the river Thame
Cholera has raged most fiercely in this quarter. In the high-lyi
levels, on the contrary, cholera has been comparatively unfreque
in its attacks; consequently, the inference is obvious that low lyi
spots are unfavourable to life. The Regent's Park, for instance,
some 120 feet above the assumed level, while the Strand is only som
20 on the average; and certainly there can be no comparison betwe
them, as regards the rate of mortality since cholera came to th
country. It is the same with regard to the higher lying districts ad-
jacent to the Strand,—Covent-garden, for instance,—which is on a
average about thrice the altitude of the Strand portion of the metro-
polis; cholera having manifested itself very little in this neighbour-
hood in comparison. St. Paul's cross is higher than the highe
ground in the vicinity of London, with the exception of the upp
part of Highgate; and the houses in Circus-road, St. John's Wood,
are on a level with the summit of Primrose Hill.

STEAM-HUSBANDRY.

The *Mark Lane Express* notices an interesting machine, or com-
bination of machines, erected on a property near Shaftesbury. Th
machine (for it seems like one perfect whole) receives the sheave
disengages the corn, clears it of all small seeds, re-thrashes a
ears that may escape the first operation, winnows it from the cha
separates the best from the imperfect corn, conveys the best in
the market sacks, deposits the tailing in another part of the ba
and passes the straw into the yard. It also accurately weighs th
sacks of corn; and as the scale turns shuts off the supply; ri
the call-bell, so that the man in attendance ties and removes t

:ing it by an empty one, to be filled and removed in the er. At the same moment a pair of mill-stones is engaged rn, and producing meal for the consumption of the cattle; g apparatus is not yet added. The corn-bruiser is also its part in the preparation of food for the stock. The g machine is in full operation, and the bone-mill at work. of this machinery is said to be of the most simple con- nd not easily thrown out of repair. It is worked by a -engine, not consuming more than 1 cwt. of coal per hour, d by one man.

PALMER'S WHEAT DRILL.

ention designs to combine, in a simple and substantial form, ages of the numerous English and American Drills. The consists of a simple axle, four by six inches, and a pole, er of which is placed a box or hopper. One simple dis- iven by a cam wheel and friction rollers, conveys the grain opper into the several drills, through hollow braces or the quantity in each drill cannot vary a spoonful in sowing . Each drill is independent of the others, and either can stone or other obstruction eighteen inches high, without with the operation of the other. It will drill perfectly a d any width, from four inches to the entire width of the d will work on land of any shape, without wasting the the teeth or drills can be raised or remain in a position twenty inches from the ground, rendering it perfectly safe er the roughest places. By the most simple movement, tion of seed can be stopped in an instant, or continued me ease. All the injury the drill can sustain by coming vith roots or fast stones, is the breaking of a small wooden is easily replaced. The machine is so contrived, that by le movement the interior work is exposed to view, and at grain, while passing into the drills, is in full view of the that he can detect at a glance any stoppage of the grain, remedy it.—*American Cultivator.*

MECHI'S EXPERIMENTAL FARM.

HI has accomplished on his Tiptree Hall Farm some ex- , yet costly, improvements, which we find thus described *x Standard:*—A wilderness transformed to a blooming an unsightly bog changed to an ornamental expanse of sum up in a few words what must have involved no in- labour and expense to perform, and the exercise of a ste to project. Turning thence to the homestead are antial buildings of brick and slate in lieu of the old wea- d thatch; among them the large barn, formerly a fruitful dicule with Mr. Mechi's opponents, as capable of holding his whole farm would produce, but now flanked by iron , as *witnesses of a libel* which the boldest have not for a

long period dared to reiterate. Here in the same buildin the various processes of threshing, dressing, grinding, ch pumping, &c., down to turning the grindstone, and cookin or turnips, all through steam-power. Traversing the fa are visible which, but for their gradual accomplishment, seemed scarcely less than miraculous—draining, deep paring and burning, the liberal use of manures, and othe and practical operations, having with thin-seeding broug sterile heath crops that would do no discredit to the best l most experienced farmers in the kingdom. Mr. Mechi having a wheat crop every year, dispensing altogether w except such can be called so which are at the same time green crop. Thus, fields now growing roots or pulse, thou in 1848, will be again devoted to the staple crop in 1850; is not with Mr. Mechi a new experiment, but part of his tem, the result would seem to give a verdict in favour of tions upon the old practice. Whether this be attributa sowing and high cultivation—to both or to either, we will to determine, still less should we dare to enter upon the de tion of profit and loss: of course, the only true test, in sense, of the general applicability of his system to farms l with no other resource than the returns from their occu this as it may, however, no one can refuse to accept the dence of the capabilities of the soil to afford, under better n a larger amount of production. An instance of this was po a splendid piece of wheat estimated at five quarters per a upon what was formerly a piece of pasture, the staple which was twitch, and almost valueless for any purpose the simple process of paring and burning, without the a any manure, had rendered as productive as already descri

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COLOURING GREEN TEA.

A CORRESPONDENT of the *Athenæum*, who recently p a Tea Manufactory in the city of Changhou, happened to merchants who came from the celebrated Green Tree Wheychou, from whom he gathered the following inform would not acknowledge that any colouring matter was manufacture of their teas, and pretended to laugh at the a thing. They said, moreover, that they were aware th colouring was a common one about Canton, where infer made; but that they never coloured their teas in Wheycl afterwards, the writer had an opportunity of seeing the w which he thus describes, from notes made at the time:- intendent of the tea-makers managed the colouring part o himself. In the first place, he procured a portion of ind threw into a porcelain bowl, not unlike a chemist's crushed it into a fine powder. He then burned a quanti in the charcoal fires which were roasting the tea. The was to soften the gypsum, in order that it might easil

o a fine powder, in the same manner as the indigo had been. When ken from the fire, it readily crumbled down, and was reduced to wder in the mortar. These two substances, having been thus pre-red, were then mixed up in the proportion of four parts gypsum to ne of indigo, and together formed a light blue powder, which, in s state, was ready for use. This colouring matter was applied to tea during the last process of roasting. The Chinese manufac-er having no watch to guide him, uses a joss stick to regulate his vements with regard to time. He knows exactly how long the s stick burns, and it, of course, answers the purpose of a watch. e minutes before the tea was removed out of the pans, the superin-dent took a small porcelain spoon, and lifted a portion of the ouring matter from the basin, and scattered it over the tea in the t pan: he did the same to the whole, and the workmen turned the ves rapidly round with their hands, in order that the colour might well diffused. During this part of the operation the hands of the n at the pans were quite blue. The writer took trouble to ascertain cisely the quantity of colouring matter used in the process of dying en teas: certainly not with the view of assisting others, either at ne or abroad, in the art of colouring, but simply to show green tea nkers in England—and more particularly in the United States of nerica—what quantity of gypsum and indigo they eat or drink in course of a year. To 14½ lbs. of tea were applied rather more n an ounce of colouring matter. For every hundred pounds of green which are consumed in England or America, the consumer really s more than half a pound of gypsum and indigo; and there is little ubt that in many instances Prussian blue is substituted for indigo. five minutes from the time of the colour being thrown into the n, the desired effect was produced. Before the tea was removed, e superintendent took a tray, and placed a handful from each pan on it. These he examined at the window to see if they were uni-rm in colour; and, if the examination was satisfactory, he gave the der to remove the tea from the pans—and the process was complete. sometimes happened that there was a slight difference amongst the mples; and in that case it was necessary to add more colour, and nsequently keep the tea a little longer in the pan.

Upon this, another Correspondent of the *Athenæum* writes, that if e above account be, in some respects, correct, it is not for the Eng-h market only. He then relates having bought some excellent een tea at Ningpo, such as was intended for the use of the better ass of the Chinese; and if it were all dyed with gypsum and indigo, ey must have been aware of what a filthy decoction they were swal-wing. The better class is specially meant; for the tea used by the ople who remained in the districts which the writer occupied was de-table; and as they were many of them in comfortable circumstances, l as you cannot go into even the wretched hut of a peasant without ving tea offered you, and as the informant always tasted it when ered, he considers himself a tolerable judge of the tea used by the ner and *yeoman class at least* of the Chinese in Chusan. In the

neighbourhood of Canton, as English gentlemen resident on told the writer, it is a common thing to manufacture green damaged black by a process similar to that mentioned in th ing letter. But this is only green tea of the same relative c the really good green that the three shilling sloe-leaf te chandlers' shops bears to good souchong. Notwithstanding quoted ocular demonstration, the second writer is inclined t that the merchants of Wheychou spoke the truth when the the indigo imputation; and as he is quite sure that the Ch drink green tea themselves when they can get it, the public be frightened into discarding good hyson.

DESIGN IN CALICO PRINTING.

MR. GEORGE WALLIS has read at the Government Design, at Somerset House, the First of a Course of Three which the Board of Trade have engaged the author to the other two being on Design as applied to Silk Weavi Jacquard Loom, and on Embroidery by Hand and by M In the lecture on Calico Printing, the technical conditions as involved in the various modes of production, were pointe nature of mordants, resists, and discharges, and their peculi on the artistic effect produced in printing, both as regards c light and shadow, explained; whilst form was shown to be on the mechanical rather than on the chemical conditions c tion. The various methods of block printing, machine p cylinder, and the metal types first used for calicoes, and no to carpets, were rapidly gone over. The distinctive resul in madder and steam prints, required a larger amount of e than one lecture enabled the lecturer to give; but the lead ence between the two methods, as exemplified in the mo laines, as examples of steams, and the calicoes, known as ' prints, as specimens of madders, was clearly shown. T methods of engraving the patterns on copper cylinders, an ditions these methods imposed upon the designer, formed feature of the lecture; and models of a cylinder, with a m used for engraving cylinders, after such mill has been rai hand engraved die, were exhibited. The lecturer showe conditions of design as to artistic effect were not so limite be at first inferred, and that range of colour was one of the tations in the ordinary class of printed goods; but in the s of mill-work or machine engraved cylinders, smallness of shown to be essential. In furnitures, cost alone limited since almost every effect of light, shadow, and colour, co produced in this department of calico printing; and Mr. gested that the historic styles of ornament could scarcel legtimately employed, certainly not in textile fabrics, than bellishment of furniture chintzes.—Builder, No. 537.

DECORATIVE PRINTING.

ersons are aware at least of the existence of the Anastatic Process; by which engravings, printed pages, &c., are l to zinc or stone—and thus fac-similes are very readily The process consists essentially of the application of cers which possess the property of softening the ink upon the ter which it is "set off" upon the stone or zinc. Our has been directed to a process by which analogous results ed by means which are curiously opposed to those employed astatic process. We are informed by the inventor, Mr. Birmingham, that he prepares the paper on which is the that he desires to copy, with some material which actually e printing ink, but which, at the same time, prevents any te parts of the paper from receiving ink. The print being te, is subjected to an inking process by which every line of ving, lithograph, or wood-cut, receives a fresh layer of ink, which a faithful copy may now be obtained. We are told any as fifty impressions have been taken from one print njuring the original. If thoroughly successful, this inven-Mr. Pettitt appears to promise many advantages. The who is engaged in the decoration of papier maché materials, to employ his discovery for producing on glass, copies of s of art, which he afterwards paints and ornaments in a way his own. We have seen some of these works; the effect is ilar and not unpleasing. Considered as the first efforts in a of decorative art, they are of considerable promise; and we it if Mr. Pettitt would direct his attention to perfecting his o as to enable him to copy with fidelity first-class line en-he might obtain the power of introducing specimens far less able in point of taste than the unnaturally coloured paintings w decorate the papier maché manufactures of our country.—m, No. 1120.

ORNAMENTAL PAPER.

E LA RUE, of Bunhill-row, has patented certain Improve-producing Ornamental Surfaces on Paper and other Sub-The iridescent colours peculiar to thin plates of glass, soap and other filmy substances—known by the name of "New-gs," from having been first investigated by that great phi-—are familiar to every one. Of the same class of phenomena eautiful tints exhibited by steel when raised to any tempera-w red heat, and by polished iron when immersed in a solution e of lead, and connected with the positive pole of a galvanic while the wire of the negative pole is dipped into the solution; t resulting in the one case from a slight oxidation of the d in the other *from* its being coated with the peroxide of *like manner, a* variety of colours are produced in the Da-*e process by the* vapour of iodine or bromine acting upon *f silver.*

The present invention consists of a very ingenious applic these facts to the embellishment of paper and other similar sub The article to be ornamented is placed in a shallow open vess the surface to be covered by the film uppermost. This vessel with clear water to about four inches above the article, an spirituous solution of some resinous substance, or some ba added, in sufficient quantity to cover the water with a thin fi sessing the iridescent colours peculiar to such bodies. W solvent has evaporated, and the film has become dry and pli article is gradually lifted out of the water in a sloping pos allow the water to escape from between the surface and t which leaves the iridescent film permanently attached to the which is then placed on a sloping board to dry. When the are irregular, or in basso-relievo, the article is placed in a pe false bottom with handles, and lifted out in an inclined positio when the article is a statue, or other figure in the round, i pended to a wire, and made to rotate while being withdrawn f water. Instead of the article being withdrawn, the water ma off at bottom. A variety of tints may be produced by allow varnish to fall in drops upon the surface of the water, and co them together by curling them with a comb; or by carefu drawing a portion of the film towards the sides of the vesse spatula. In order to make the varnish run more easily u surface of the water, it is proposed to mix an essential oil The patentee states that he prefers to employ clear water as a and hard white varnish, mixed with an equal portion of spike oil. A dark surface is stated to be susceptible of producing effect by being thus ornamented than a fine white one.

COMPOSITION PICTURE-FRAMES.

MR. ILES, of Birmingham, machinist, has patented cert provements in Manufacturing Picture-frames, Inkstands, an articles in Dies or Moulds; also in producing Ornamental S

1. Mouldable articles are to be manufactured with veined or surfaces by mixing with the plastic material employed differ loured silk waste or other differently coloured fibrous su The plastic material preferred is composed of 4 parts of resi of wax, 6 parts of glue, 4 parts of alum, and 12 parts of The resin and wax are first melted in any suitable vessel, and added; the alum and gypsum are then well incorporated, an the waste silk is stirred in. The whole is then ready f moulded into the desired shapes.

2. Ornamental surfaces on walls and other places are to duced by mixing with Keene's, or any suitable cement, d coloured silk waste, or other differently coloured fibrous mate the same way as hair is stirred in mortar;) the mixture bei wards floated on the walls in the ordinary manner.

INDIA PAPER PROOFS SUPERSEDED.

THE use of India Paper for printing from engraved plates is open serious objections; the chief of which are its comparative expensive-s, and its liability to be affected by damp, which causes it to rise m the thicker paper on which it is affixed; thus rendering it ex-mely troublesome to preserve such an engraving in good condition, even to have it subjected to the ordinary preparations for framing. se disadvantages have, of course, militated greatly against the em-yment and the popularity of the India paper; even those who ld afford to pay the additional price of India paper proofs often fer a common print for incurring the risks of their getting spoiled ch are incidental to the finer impressions.

A process has been discovered by Mr. S. Leith, lithographer, Edinburgh, by which all the advantages of printing on India paper ng with additional advantages peculiar to itself) are secured at a e tithe of the expense. One of the most striking features of this ention is, that it is applied to engravings after they are printed off common paper in the ordinary way, so that the oldest as well as most recent engravings can safely and effectively be subjected to process. Though only one piece of paper is used, close examina-both by the finger and the eye would, without other assurance, to convince one that there are not two separate sheets employed n India paper proofs. Every variety of shade can be produced—n the most delicate to the richest tinting. The effect of the pro-also is such that instead of in any way dimming the impression, night be supposed, it actually renders it clearer and more effective. this way it actually brings up an impression from a partially ex-sted plate into something like its original sharpness. It is equally licable to lithographs, to mezzotints, and to line engravings; and be as readily used in the case of an engraving taken yesterday as one a hundred years old. It is so equal and unerring in its ope-on that the chances of an engraving being spoiled in being sub-ed to it are so slight as not to be worth consideration; after ing undergone the process, an engraving is less liable to damage n before, for the ink enters into chemical combination with the in-lient employed, and becomes thoroughly dried and fixed as it were paper, so that any ordinary amount of friction, such as would blur disfigure a common print, produces no effect on one treated in manner.—*Scotsman.*

SPLITTING SHEETS OF PAPER.

CORRESPONDENT of the *Mechanics' Magazine* claims the priority for accomplishment of this object, and likewise of applying it to a use-and ornamental purpose. "For several years, beginning about 1828, writes) I was in the habit of occasionally making white wood boxes, various kinds, which I ornamented with Indian ink drawings, or by nsferring, in the ordinary way, impressions from engraved plates, od-cuts, or from lithographic stones. But the inverting of land-pe views was a great defect in the mode of transferring. This in-

duced me to adopt a way of Splitting the Sheet, so as to leave the l
quantity of fibre compatible with leaving the ink undisturbed; so th
when transferred and properly varnished, the grain of the wood a
peared as distinctly as if no other substance intervened besides t
varnish."

To this is added a description of the mode by which is accomplish
the splitting previous to transferring.

If the sheet is sized, soak it in hydrochloric acid, much diluted wi
water, till the size is rendered perfectly soluble in moderately war
water. When well washed, press it gently between blotting paper
While still damp, lay it between two sheets of smooth, firm paper
previously coated with a solution of isinglass or other clear size on
one side. Press the sheets well together, and leave them till perfectly
dry. Now, by carefully separating the two outer sheets, the middle
one will be evenly ruptured or otherwise, accordingly as one sheet is
bent more than the other during the process of separation.

The sheet intended to be transferred may be reduced still farther by
carefully rubbing the back with fine glass paper, when it may be
transferred; the wood having had a coat or two of clear turpentine
varnish previously, the last coat being in a tacky state. When the
varnish is thoroughly dry, the outer sheet should be moistened with
water till the size beneath is sufficiently softened to permit of its being
stripped off. The size should then be carefully washed away, and the
paper dried, when it will be fit to receive the requisite coats of varnish,
to give transparency and body to admit of polishing.

The mode of splitting a printed sheet must be very obvious to all
who are familiar with the modern practice of preparing the flexible
backs of the finer quality of books previously to the pasting on of the
morocco coverings.*

In the *Civil Engineer and Architect's Journal*, we find the following
instructions for splitting paper:—

Procure two rollers or cylinders of glass or amber, resin, or metallic amalgam; strongly excite them by the well-known means, so as to produce the attraction of cohesion, and then with pressure pass the paper between the rollers. One half will adhere to the under roller, and the other to the upper roller, and the split will be perfect. Cease the excitation, and remove each part.

TO MAKE LIQUID GLUE.

DISSOLVE one quarter of a pound avoirdupois of shell lac, in three ounces of Apothecaries' measure of naphtha; put the shell lac into a wide-mouthed bottle, and pour the naphtha upon it; cork it up and stir it with a piece of wire two or three times during the first six-and-thirty hours. It can be made without any measurement at all, by adding shell lac to naphtha until it becomes of the consistence of cream. When the shell lac is thoroughly dissolved in naphtha, it

* See Mr. Baldwin's mode of Splitting Paper, noticed in the *Year-book of Facts*, 1849, p. 105.

uid Glue always ready for use, and peculiarly applicable to
maker, joiner, or carpenter, and perfectly waterproof, with
ngest joint may be rubbed close.

ZINC PAINT.

A. F. ROCHAZ, St. Swithin's Lane, has patented improve-
e manufacture of oxide of zinc, and in the making of Paints
s where Oxide of Zinc is used. The first regards the su-
the zinc into oxide, the pure particles of which are col-
lhesion to ranges of bands suspended in canvas-covered
or the purpose. The coarser particles are thus kept
and used, under the second section of the specification, as
en mixed with mortar. The patentee states that he makes
apidly drying, white pigment with twenty parts white zinc,
two turpentine, and one drying oil.

ch Government, according to Galignani, has recently
in future the white paint used in public buildings shall be
ite zinc, instead of white lead. Considering the injurious
e use of paint made from white lead, adds the same autho-
e dreadful effects that the lead produces in the manufac-
e it is prepared, it is much to be hoped that the example
Government will be followed by the public.

TAPESTRY CARPETS.

ell-known defect in the construction of the ordinary Carpet
l as in all damask work, that but a limited amount of co-
be introduced into the cloth, except at extraordinary ex-
by giving an undue weight to the body of the fabric. To
, an English company at Halifax took out a patent some
which has been successfully wrought for several years, by
eater variety of colouring and figures is introduced into
k than formerly; and latterly, an enterprising firm of
e patented a still further improvement on the Halifax in-
ich lessens the labour, and yet fully sustains the beauty of
This invention has been brought out by Mr. Matthew
ter several years of close devotion to the subject, and the
nd application of some powerful and intricate machinery.
Mr. Cochran was to obviate a defect in the English pa-
can only colour the web in small parts; whereas, by his
several webs can be coloured at the same time, and an end-
of the most beautiful figures may be produced, in which
and hue which the dyer can invent are most harmoniously
ether. As an instance of the advantage of this invention,
tates that, while he was present, the workmen were engaged
ome webs for an English carpet company, which contained
n twenty-eight different shades and colours. All these
rown up in one figure, and if it were possible to produce
y-eight colours different, they could be made to follow in
ure in *this cloth without* embarrassing either the maker or

the fabric in the smallest. The Jacquard machine performs an important function in the produce of this new fabric; but complicated and ingenious as that important invention is, it is simplicity itself compared to the accompaniments that have been added for completing the cloth by Mr. Cochran.

ON THE DURATION OF WOOD, AND MEANS OF PROLONGING IT.

THE following are the results of experiments made with great care and patience, by Mr. G. S. Hartig:—Pieces of wood of various kinds 2⅝th inches square, were buried about an inch below the surface of the ground, and they decayed in the following order—the lime, American birch, alder, and the trembling-leaved poplar, in three years; the common willow, horse-chestnut, and plane, in four years; the maple, red beech, and common birch, in five years; the elm, ash, hornbeam, and Lombardy poplar, in six years; the robinia, oak, Scotch fir, Weymouth pine, and silver fir, were only decayed to the depth of half an inch in seven years; the larch, common juniper, red cedar (*Juniperus Virginiana*), and arbor vitæ, at the end of the last-mentioned period, remained uninjured. The duration of the respective woods depends greatly on their age and quality, specimens from young trees decaying much quicker than those from sound old trees; and when well seasoned they last much longer than when buried in an unseasoned state. In experiments with the woods cut into thin boards, decay proceeded in the following order, commencing with the most perishable:—The plane, horse-chestnut, poplar, American birch, red beech, hornbeam, alder, ash, maple, silver, fir, Scotch fir, elm, Weymouth pine, larch, robinia or locust oak. It has been proved by recent experiment that the best mode of prolonging the duration of wood is to char it, and then paint it over with three or four coats of pitch; but simply charring the wood was of very little utility, as were also saturations with various salts, &c.—*Revue Horticole.*

PRESERVATION OF WOOD FROM WORMS, FIRE, &c.

M. LOUIS VERNET, Buenos Ayres, has patented a method of Preserving from Destruction by worms, insects, decay, and fire, certain vegetable and animal substances. To protect timber from fire, it is to be impregnated with a solution of 1 lb. of arsenic, 6 lbs. of alum, and 10 lbs. of potass, in 40 gallons of water. To preserve timber immersed in water from decay, and the ravages of the worm, it is to be painted over with the solution mixed with oil or any suitable tarry matters.

TO INCREASE THE EFFECTIVE STRENGTH OF BEAMS.

WE learn from the *Journal of the Franklin Institute*, that a patent has been granted to Mr. J. R. Remington, for "An Improvement in the method of Increasing the Effective Strength of Beams or Rafters of Wood or other Materials, used in bridges and other structures." The patentee states his invention to consist in so arranging timbers or beams as to avoid their tendency to break in the

middle of their length; this is effected by extending the ends of the timbers beyond the points of support, and there bracing or tying them down so as to render the points of support fulcra; the tendency to break in the middle of the length is thus in part transferred to the points of support; for it will be evident that thus supported the timbers cannot break in the middle without breaking also at the two points of support.

A FLOATING CHURCH.

THIS is a real Church Afloat—a new Gothic structure, with tower and spire, belfry and bell—capable of accommodating 550 worshippers. Built of wood, it is painted to represent brown stone. Its dimensions are 86 feet by 34,—with a passage all round it. From the deck to the ball on the spire is 80 feet in height. The whole rests on two boats of 90 tons burden. It was constructed at New Jersey, for the Churchmen's Missionary Association; and is moored at a wharf in Philadelphia, for the use of sailors and boatmen.

ARTIFICIAL MAHOGANY.

THE following method of giving any species of wood of a close grain the appearance of Mahogany in texture, density, and polish, is said to be practised in France with success. The surface is plained smooth, and the wood is then rubbed with a solution of nitrous acid. One ounce of dragon's blood is dissolved in nearly a pint of spirits of wine; this, and one-third of an ounce of carbonate of soda, are then to be mixed together and filtered, and the liquid in this thin state is to be laid on with a soft brush. This process is to be repeated, and in a short interval afterwards the wood possesses the external appearance of mahogany. When the polish diminishes in brilliancy, it may be restored by the use of a little cold-drawn linseed oil.—*Builder*, No. 332.

CUTTING FIREWOOD.

MESSRS. THOMSON AND ELMS have patented certain improvements in Cutting and Tying-up Firewood. The patentees state that the wood employed for firewood is imported in blocks about 18 inches long, having a sectional superfices of three square inches; and that it has hitherto been customary to saw them into three pieces, and afterwards to split them up by hand into suitable sizes. The object of this invention is to substitute, in a great measure, mechanical for manual labour.

1. A drum or wheel, to the periphery of which steel cutters are bolted at a convenient distance from each other, is made to revolve by means of any prime mover. In front is a vertical standard, or chopping-block, the top of which is faced with steel, and slopes upwards in a right line with the centre of the drum. The blocks, which have been previously sawn, as is usual, by the ordinary sawing machines, are fed into a trough by hand upon an endless band; they are thereby brought upon the inclined steel top of the cutting-block, at right angles to the cutters, and ready to be operated upon by them, care being taken to place the wood with the grain running vertically. Slips

of wood six inches long, three wide, and half an inch deep, are spl off, and drop on to an endless band, which conveys them into suitable receptacle. The two endless bands are driven, through intervention of suitable gearing, from the axis of the cutter-wheel These pieces of wood are then gathered up by an attendant, and subjected to the action of a second machine, whereby they are split into smaller sizes fit for domestic purposes.

2. In order to obviate the use of a second machine, it is proposed to combine a portion of a circular saw with each cutter, so that the may make two cuts at right angles to each other.

3. The tying up in bundles is effected by a machine which consi of a top and bed-plate, with semi-circular cells in each, arranged side side, and corresponding to one another. The twine employed in secur ing these bundles is led from a reel at one end of the machine throu hollow standards, and made fast to a pin at the other. The top kept separated a short distance from the bed-plate by means of spring placed between them, and a portion of twine is pulled down to the bottom of the cell nearest the end where it is made fast, and then held by the finger, or by a pin, while the attendant places the sticks in the cell, and so on, until they are all filled. He screws down the top plate to compress the pieces tightly together, cuts the string abou each bundle, and ties them up; after which he unscrews the machi removes the bundles, and recommences the operation.

4. Or, instead of the preceding apparatus, the patentees pro employ a number of conical cylinders, to which sticks of w supplied through a hopper, in any convenient manner. A nu plungers are caused to act in the cylinders, and at each st drive the pieces of wood rather more than half out of the co opening, when they are tied together by string or wire. T ceeding lots of sticks, which are driven forwards by the next s the plungers, drive the tied-up bundles out of the conical cylin to an endless band, by which they are conveyed into suitabl tacles, whence they are removed and stored up ready for sale.

FLEXIBLE IVORY.

It has been long known that in subjecting bones to the ac hydrochloric acid, the phosphate of lime, which forms one component parts, is extracted. Bones preserved in this mann their original form, and acquire great flexibility. It is by this that M. Charrière, the maker of surgical instruments in Paris, the Ivory of which he makes use to manufacture flexible tubes, and other instruments. These pieces, after receiving the form and polish, are steeped either entirely or partially in acid with water, where they remain as long as required. The ivo having undergone this preparation, becomes supple, flexible, and assumes rather a yellowish colour. In the course of d again becomes hard and inflexible; but the flexibility of the iv be restored by wetting, either by surrounding it with a piec *linen, or by placing sponge in the cavities of the pieces.* So

.ve been kept in a flexible state in the acidulated water for they were neither changed nor injured, nor too much :hey had acquired no taste nor any disagreeable smell. ration of flexible ivory may give rise to various useful of it in the arts or in manufactures.—*Patent Journal.*

NEW MODE OF FACING WALLS.

IN TAYLOR, jun., architect, has patented a mode of con- id Facing Walls, which professes to avoid the objections sting against erecting brickwork with a facing of stone, i the subsidence of the numerous mortar joints in the for- red to the latter, by which the stone facing unavoidably be- 'iously weighted, and the crushing of the bed is the result. this, he carries up the brickwork, simultaneously suspend- ng stones thereon, and bonds in every stone, by weighting ost adapted for it by the superstructure; but leaving the ed-joints open until the danger from the subsiding of the its is at an end, when the stone may be allowed to take a d become a portion of the construction by pointing up. He oled to dispense with much of the stonework hitherto neces- ordinary mode of construction, and reserves only sufficient on, appearance, &c.; and as he further proposes to obtain uired by steam power, a saving of more than half, it is as- be effected in the cost of the stone.—*Builder*, No. 320.

MANUFACTURE OF CARPETS.

RPMAEL has read to the Royal Institution, a paper "On rovements in the Manufacture of Carpets." The lec- nenced by shortly explaining the nature and texture of rsian, and Brussels carpets. In the making of the first tist is in no way restricted in designing patterns: any de- e executed, because each knot of the colour and pattern is nd in progress of weaving. In the manufacture of Brussels on the contrary, the artist is restricted by reason of the ng produced from the warp of the fabric. Hence only a lours can be employed in the direction of the length of a peting; and, in fact, with few exceptions, the best Brussels re ever consisted of five colours, and what are technically re-frame carpets,"—in which four-fifths of the worsted uried in the fabric, and one-fifth only comes to the surface. nael stated, that till lately carpets had all been woven by pattern being produced by the aid of draw boys, or by acquard cards. Within the last few years, two mechanical had been introduced,—one by Mr. Wood, and the other by r. The first is for working by power, and for introducing awing the wires used to raise the pile. The second is for th instruments to take hold of the warp, so as to dispense e of wires.

t improvement noticed was that invented by Mr. Whytock,

of Edinburgh, and which is now very largely worked by Crosley and Co. of Halifax, Yorkshire,—of which manufact very beautiful specimens were exhibited. This invent sists of employing printed warp in such manner that all is brought to the surface; and the substance of all such car place of consisting largely of wool, as heretofore, depends costly but stronger material. By this invention, the simp only is required; and the designer is in no way restricted as of colour. Any design of the artist may be executed, how colours may be required,—increased numbers of colours not the cost. The peculiarity of this process consists of pr separate yarns of which a warp is to be composed; and thi in such manner, that each yarn having had its colours applie and the proper number brought together side by side to c warp, the desired pattern is produced. Each yarn is w cylinder of large diameter, having a graduated scale there children (who apply the colours), having pattern papers be have only to notice what colours are on the successive divisi pattern-papers, and to apply the colours in succession l colour-rollers across the surface of yarn wound on the c thus making simple marks of colour on the yarn at interv being according to the designs on the papers, when the sev constituting a warp come together, the pattern is produced warp being woven into a fabric with raised pile by the us the most beautiful and varied results are obtained. This p readily made clear by the aid of diagrams, which showe pattern-papers.

The next improvement to which attention was called Messrs. Templeton and Co. of Glasgow,—which consists important modification of the old Chenille weaving. Se elegant specimens were produced. Formerly, in weavin shawls, the woven weft was twisted so as to cause the fibr off in all directions, by which both sides of the fabric w with were alike. Hence, when the weft was woven wit colours, and according to design, the pattern appeared on In applying this class of weaving to the carpet manufactur Templeton and Co. have caused the weft to be so woven t edges have a tendency to come together, so that when w fabric the whole pile comes to one surface; by which the n results are obtained: and here, again, the designer has latitude. These points were rendered clear by the aid c and specimens of the woven weft.

The next improvement explained was that lately int Messrs. Bright and Co.,—which consists of printing Brus by the process of block-printing. Several specimens were which gave considerable promise. Mr. Carpmael also e machine, the invention of Mr. Wood, for using rollers scriptions of work in place of blocks. The difficulty Brussels carpeting consists in getting the colour to pen

without spreading. This is only to be accomplished by repeated impressions;—hence the difficulty of using blocks or rollers, so that they shall keep register with several colours, and at the same time repeat accurately several times on the same surfaces.

The last improvement was one lately introduced by Mr. Wood,—which consists of employing a soft back weft in weaving Brussels carpeting, in place of increasing the linen warp in those cases where all the worsted is brought to the surface. By this invention the back is made more soft and elastic to the tread, and increased durability is given.—*Athenæum*, No. 1127.

ENVELOPE MACHINERY.

Mr. Faraday has illustrated at the Royal Institution, the Construction of Envelope Machinery. One million of envelopes are daily manufactured in the British Islands. Each of these requires to be cut and folded with precision. The former operation is performed partly by Wilson's patent cutting machine, and partly by means of a sort of large hollow chisel, the cutting part of which is exactly the shape of the required envelope. The folding was, till within the last three or four years, entirely done by human labour. Since that time this process has been performed at the manufactory of Messrs. De la Rue and Co. by a folding machine, the invention of Mr. Edwin Hill and Mr. Warren De la Rue. By means of the admirable precision and rapidity of this engine, forty-two envelopes can be folded in a minute. This folding machine, which Mr. Faraday commended in terms of most merited praise for its singular ingenuity and efficiency, consists of —1. A *table*, or metallic surface, of the exact size of the envelope which is laid on it, and which moves in a vertical plane. 2. A corresponding surface called the *box*, which, descending on this table, creases the envelope, and then opens so as to permit the partial folding of it. 3. Four *folders*, two of which press down the corresponding flaps of the envelope before the box is entirely raised; the two remaining ones follow with their pressure after the remaining portion of the box is lifted up. 4. Two finger-shaped projections made of caoutchouc, which, owing to their property of adhering to a paper surface, never fail to carry off each envelope as fast as it is folded. Though there are twenty-two movements for folding each envelope, and each successively formed with great rapidity (the several motions succeeding each other) there is no blow or jar of any kind in the working of the machine. This is the effect of a regulation of velocity produced by *cams*. A cam is not defined by any of the mechanical books we have at hand; but it is essentially a guiding surface against which the piece to be moved is made to bear. This guiding surface is so adjusted that the space described by any working point controlled by it shall vary according to the projection or groove of the cam. Mr. Faraday showed that wherever, as in this instance, a reciprocation of motion was required (*the working point commencing from and arriving at a state of rest, and then returning back in its former course*), it was necessary that the spaces described in

times should vary with the odd numbers, beginning with with 1. Thus in

1 2 3 4 5 6 7 intervals of time
1 3 5 7 5 3 1 spaces

must be described by the working point. The mode ir cam-curve was laid down for this purpose was exhibited cam, 4 feet in diameter, with a lever attached, and then operation of cams so divided was displayed in the workin the folding machines. The statistics of this subject a teresting: they were first brought before the Instituti Barlow, in a discourse on the Penny Post. In the year 220,000,000 letters were posted in Great Britain. The r exceeds 330,000,000 annually, a number which, taking length of a letter as five inches, if laid end to end would r miles, *i. e.* a distance greater than the circumference of tl

Mr. Faraday then noticed an ingenious contrivance foı a letter with its envelope: it consists of a set of perforat when the Post-Office stamp is used, cause some portion o press through the envelope to the inclosed letter, so the two are put together, they complete the lettering of the sta *næum*, No. 1128.

LEAD SHOT TOWER.

Mr. D. Smith, of New York, has patented the applic ascending artificial current of air to a descending current the manufacture of leaden shot. This he proposes to ef ploying a tower-shaped at top like a funnel, and at bottom cated cone, with an annular hollow vessel resting on a water at the bottom. The annular pouring vessel is to b with holes at top, through which an artificial current of forced up the tower by a fan or other blowing machine. falls through the hollow centre of the annular vessel into tl servoir, which is furnished with a shoot to conduct the suitable receptable. Or, the artificial current may be cre hausting from the top of the tower, and allowing the air t bottom, in which case the hollow annular vessel will b with.

NATURAL GAS-LIGHTING.

There is, at half a mile from the Newton Road Stati and North Western Railway, a public-house lighted from t the attics by means of Gas obtained by merely sinking a pi quarters of an inch bore about three feet into the earth, w cient gas is procured, without any reservoir, to supply pipes for every room; the light being very bright, and n *to be purified.* A small farm-house near it is also lighted way.*

* *For other* instances of Spontaneous Gas Lighting, see Yea *1849, p. 83.*

Natural Philosophy.

THE TIDES, AS ILLUSTRATIVE OF GEOLOGICAL PHENOMENA.

CAPTAIN DAVIS, the Superintending Officer of one of the Divisions the United States Coast Survey, has laid before the Association of rican Geologists and Naturalists in Philadelphia, his researches this subject, the results of which may be thus summed up :—

1st. The form and distribution of banks, and of alluvial formations general, are, in a great measure, dependent on tides. They ought be found everywhere where the tidal current is sufficiently abated permit the materials held in suspension to be deposited. The finer lighter materials must therefore be deposited in the calmer places.

2d. The formation of submarine banks is indispensable to the mainnance of animal life, since they constitute the most favourable lities for marine animals.

3d. The formation of deltas at the mouths of rivers is in an inverse to the force of the tide.

4th. The sedimentary deposits of the most recent geological epochs g, in all respects, like the alluvial deposits of our day, we must t that they were formed under the operation of the same laws.

5th. The form and extent of continents, so far as they are comed of sedimentary deposits, are thus dependent on astronomical s, that is, on the attraction which the moon and the sun exert, in all time have exerted, on the liquid part of our planet.—sachusetts *Quarterly Review for December* 1848.) For the re papers, see *Jameson's Journal*, No. 92.

CURRENTS IN THE GUT OF GIBRALTAR.

CURIOUS investigations have, for some time, been carried on in the t of Gibraltar, by M. Coupvent des Bois. He has proved, as a tainty, the existence of a superficial current flowing from the ocean the Mediterranean, and of a deep under current flowing from Mediterranean into the ocean. He has also ascertained that bea these two currents there exists a bed of water which is in pert repose.—*Athenæum*, No. 1138.

THE TIDES IN THE GERMAN OCEAN.

A STRIKING example occurs of the happy connexion of theory th observation, in the prediction that there must exist a spot in the man ocean—the central point of an area of rotation produced by meeting and mutual action of two opposite tides—where no rise ll of tide whatever could occur :—a prediction actually verified Capt. Hewett, in 1839, without any prior knowledge that such a t had been supposed to exist. This is one among the many triphs of like kind achieved by modern science.—*Quarterly Review*.

THE LONGITUDE.

being considered interesting and important to the commercial

marine of the United States and of the United Kingdom to ascert with correctness the difference of longitude between the Observato at Cambridge, Boston, and that at Liverpool, it is proposed by th United States Government to accomplish this object by means of ma rine chronometers to be transported across the Atlantic to and fro Boston in the British and North American Royal Mail Steamer and, for this to be effected, arrangements will be made with the a thorities in this country that when the chronometers arrive at Live pool on their return from Boston, they may be transmitted with c and dispatch to the Liverpool Observatory.—*Times.*

DETERMINATION OF THE DIFFERENCE OF LONGITUDE, BY TH MAGNETIC TELEGRAPH. BY ELIAS LOOMIS, ESQ.

THE writer first refers to a series of experiments made under t direction of Professor Bache, for the determination of the Differe of Longitude between New York, Philadelphia, and Washington, means of the magnetic telegraph. By this series of experiments considers it established that, by the use of Morse's telegraph, t clocks distant from each other 200 miles can be compared togeth with the same precision as if they were placed side by side; and t the difference of longitude of two places can be determined with t same precision as the relative error of the clocks. These results w so satisfactory that Professor Bache determined to prosecute th more extensively, and during the past summer comparisons have b made between New York and Cambridge observatory near Bosto The plan of operation this season was more matured than during t former. The comparisons were all made between a solar chronome at Cambridge and a sidereal clock at New York. At ten o'clock the evening, the two observatories having been put in telegrap communication, when the seconds hand of the solar chronometer ca round to 60″, a signal was given at Cambridge, by pressing the k of the telegraph-register; at the same instant a click was heard New York, and the time was recorded according to the sidereal clo At the end of 10″ a second signal was given, which was also record at New York; at the end of another 10″ a third signal was giv and so on for sixty seconds. The Cambridge astronomer then co menced beating seconds by striking the key of the telegraph-regis in coincidence with the beats of his chronometer. The New Yo astronomer compared the signals received with the beats of his clo and waited for a coincidence. When the beats were sensibly synch nous the time was recorded, and the astronomer waited six min for another coincidence of beats. The Cambridge astronomer co tinued beating seconds for *fifteen minutes*, during which time t New York observer was sure of two coincidences, and might obta three. When these were concluded, the New York astronomer the same manner gave signals for one minute at intervals of 10″, then beat seconds for fifteen minutes, during which time the Ca bridge astronomer obtained four or five coincidences upon his ch nometer. This mode of comparison was practised every night, a

onsidered that the uncertainty in the comparison of the time-pieces not exceed two or three hundredths of a second on any night; and a series of comparisons the error may be regarded as entirely elimi-ed.

Another mode of comparison which was practised is that of tele-phing star transits. A list of stars which culminate near our ith at intervals of five or six minutes was prepared, and the ob-vers, both at New York and Cambridge, were furnished with a y. They then proceeded as follows: Cambridge selected two stars m the list, which we will call A and B, and struck the key of his ister at the instant when the star A passed each of the seven wires his transit. These signals were heard at New York, and the times orded. Cambridge then observed the transit of star B in the inary manner without telegraphing. New York then observed the sit of star A on his meridian in the usual manner; and struck his at the instant the star B passed each of the seven wires of his sit, which signals were heard and recorded at Cambridge. The erence of longitude between New York and Cambridge is nearly lve minutes, affording ample time for all these observations. Thus w York obtained upon his own clock the times of transit of star A r the meridians of Cambridge and New York; and Cambridge ained upon his chronometer the times of transit of star B over the e meridians. The dfference of these times gives the difference of gitude independent of the right ascension of the stars. Both ob-vers then reversed the axis of their transit instruments; Cambridge cted a second pair of stars from the list, and the same series of ervations was repeated as with the first pair. The error of colli-ion was thus eliminated, and by confining the observations to stars hin about five degrees of the zenith, the influence of azimuthal r was avoided. The level being read at every reversal, the cor-tion for it was applied by computation. In this manner it is ed to eliminate every possible source of error, except that which es from the personal habits of the observers. In order to eliminate error, a *travelling* observer worked for a time at Cambridge and pared with the Cambridge astronomer; then came to New York compared with the New York astronomer; then returned to nbridge again, and so on as often as was thought necessary. ally, at the conclusion of the campaign all the observers were to t at Cambridge and compare their modes of observation.

On one or two nights the preceding programme was changed, and h observer telegraphed both star A and star B.—*Proceedings of Royal Society.*

THE MAGNETIC AND THE NORTH POLE.

A PAPER has been read to the British Association, "On the Or-al Motion of the Magnetic Pole round the North Pole of the th," by the Rev. J. Grover. This was shown by tracing the po-ons of the magnetic pole at several intervals during the last 250 rs, by *converging lines* drawn from the London, Paris, and St.

Petersburgh observatories, and deduced by computations of the d ferent variations of the magnetic needle at these places. These chan were illustrated very distinctly upon the different polar horizons of t observatories, and the orbit drawn from them in its proper position An extraordinary acceleration of this motion from 1580 down to 172 was pointed out, and a pause at that period, which indicated a clim in that year, in which both the horizontal movement of the need was suspended, and the dipping motion changed its course from downward to an upward motion. Mr. Grover showed also a ser of changes in the lines of equal declination about the isodynam poles, which appeared to indicate a direct tendency, or attracti force operating upon the magnetic needles from the poles; this assumed and proved to be sufficient to account for the extra lin position of the lines of no declination between Europe and Asia, well as for the extraordinary curvatures of the declination lines served in the north of Asia on the two sides of the isodynamic p and on the origin and changes of the closed systems or ovals in Asiatic and Pacific allocations. Mr. Grover regarded the mov magnetic pole in the light of a satellite, or supplemental system, the isagonal poles; disturbed by the accumulation of ice about poles in the course of a long series of ages, and generated as a c pensative process from an interruption of the original system.

LAW OF STORMS.

Captain Handley, of the *Sultany*, has tested the truth of the which regards tropical tornados as cyclones, or revolving masses of travelling along certain curved lines. The edge of the cyclone refe to was 30 degrees at least from Bombay, Calcutta, and Aden; an effects were felt at the distance of 2,000 miles. The course of the *Sultany* was S.W., when, overtaken by the storm, Captain Han says, in his log, he " furled the topsails and foresails, and rounded ship to, with her head to the eastward, as I have every reaso believe I am on the N.E. edge of a hurricane." The storm p onward to the S.W.; and thus by laying to, and steering to the ward, Captain Handley no doubt saved his ship and the 300 Co on board. This is a triumph of scientific observation.*

THUNDERSTORMS AND THE FORMATION OF HAIL.

Mr. E. Highton concludes, from the flickering observed in a of lightning, that concussions of the air caused by the electric charge give rise to the lightning and the rolling of the thunder. he accounts for by the rapid descent of rain drops when first for causing a rapid superficial evaporation, which freezes the rest o globule: this, as it moves on, grows larger by the cold conde more vapour on its surface, of which a portion is also frozen b

* Lieut.-Colonel Reid, R.E., the ingenious originator of the above t has lately published an important work on the subject, entitled "Th gress of the Development of the Law of Storms, and of the Variable W with the practical application of the subject to Navigation."—Weale.

continued evaporation, and this accretion goes on until it reaches the ground—its final rapidity being the result of the constantly diminishing resistance of the air in proportion to its weight as it grows larger.

GRAPHIC ILLUSTRATION OF ATMOSPHERIC PHENOMENA.

Mr. J. C. Adams has read to the British Association, a paper on the "Application of Graphical Methods to the Solution of certain Astronomical Problems, and in particular to the Determination of the Perturbations of Planets and Comets." After briefly pointing out the advantages of graphical illustration, the author proceeded to give some instances of their practical application. It was shown that the solution of the transcendental equation which expresses the relation between the mean and excentric anomalies in an elliptic orbit is obtained in the most simple manner by the intersection of a straight line with the curve of sines. Attention was directed to Mr. Waterston's graphical method of finding the distance of a comet from the earth, and an analogous method was given for determining the distance of a planet on the supposition that the orbit is a circle in the plane of the ecliptic. The author then passed on to the more immediate object of his communication—the graphical treatment of the problem of perturbations of planets and comets. He first showed how to obtain geometrical representations of the disturbing forces; and then gave simple instructions for determining the changes produced by these forces in each of the elements of the orbit, in a given small interval of time. Having obtained the total changes of the elements in any number of such intervals, it was shown, in the last place, how to find their effect on the longitude radius vector and latitude of the disturbed body, and thus to effect the complete solution of the problem of perturbations without calculation.

PHOSPHORIC PHENOMENON.

This Phenomenon is recorded to have taken place in a pond at Huggate, on June 11, 1849; and has been described to the British Association by the Rev. T. Rankin. The communication detailed minutely, with all the attendant circumstances of weather, the state of the barometer and thermometers dry and wet, a violent explosion of inflammable gas which took place on the above day, accompanied with smoke, a great noise, and rumbling concussion, such as to alarm all the inhabitants of the village. The explosion of the gas was propagated along the pond from N.W. to S.E. Into this pond the refuse of the village had been for ages draining, and it was a common receptacle for the dead bodies of various animals.

AMMONIA IN THE ATMOSPHERE.

By a series of well-conducted experiments, M. Fresenius has determined that 1,000,000 parts of atmospheric air contain during the day 0·098 parts of ammonia, equal to 0·283 parts of carbonate of ammonia. During the night, the same amount of air contains 0·196

ammonia, equal to 0·474 carbonate of ammonia. These results a known to be slightly in error, there being actually more ammonia the air; they are, however, the closest approximations yet made.

THE ANEROID BAROMETER.*

We have been favoured by Mr. Hartnup with simultaneous rea ings of one of the new Aneroid Barometers and the standard bar meter of the Liverpool Observatory, with the errors of the form deduced therefrom. Our space compels us to abbreviate the tal sent, but we have retained sufficient to exhibit fairly the differences.

Year and Month.	Day.	Reading of Standard.	Reading of Aneroid.	Aneroid differs from Standard.	Temperature.
1849		Inches.	Inches.	Inches.	Deg.
January	21	29·88	33·06	+ 0·18	73
—	22	29·96	30·15	·19	72
—	26	29·71	29·77	·06	55
—	27	29·70	29·75	+ ·05	50
—	28	29·24	29·22	— ·02	46
—	,,	29·24	29·19	— ·05	42
—	,,	29·88	29·91	+ ·03	37
—	29	30·96	30·03	·07	50
—	,,	30·01	30·18	·17	69
—	,,	30·05	30·23	·18	70
—	,,	30·09	30·17	·08	36
February	2	30 25	30·39	·04	49
—	11	30·82	31·11	·29	55
—	,,	30·81	31·13	·32	67
—	,,	30·81	31·18	·37	75
—	,,	30·81	31·19	·38	78
—	,,	30·81	31 21	·40	83
—	,,	30·80	31·21	·41	85
—	,,	30·80	31·22	·42	87
—	,,	30·80	31·10	·30	54
—	,,	30·70	30·96	·26	49
—	,,	30·71	30·92	·21	38
—	14	30·59	30·83	·24	51
—	18	30·34	30·56	·22	55
—	,,	29·92	30·05	·13	52
—	19	29·79	29·89	·10	55
—	21	29·60	29·67	+ 0·07	50

From an inspection of columns 3, 4, and 5, it appears that t readings of the Aneroid are more in excess of the Standard in elevated than in a low temperature, and that the variation from t cause equals about 0·004 inches for one degree of Fahrenheit. also appears that the readings of the Aneroid are more in excess the Standard with a high barometer than they are with a low ba meter, and that the variation for one inch arising from this ca

* *Described* under "The New French Barometer," in the *Year-book Facts, 1849, p. 115.*

equals about 0·16 inches. For the higher temperatures the Aneroid was placed in the heating apparatus employed at this observatory for testing chronometers. For the lower temperatures it was exposed to the open air. The barometer was higher on the 11th of February by 0·24 inches than on any previous occasion during the three years that a record has been kept at this observatory.—*Athenæum*, No. 1117.

BAROMETRIC PRESSURE IN INDIA.

THE *Bombay Times* contains an interesting article on the Barometric Variations as observed at Bombay, Madras, and Calcutta; which shows that the greatest pressure for all parts of India occurs between the 15th and 22d of January, which gradually diminishes until June, when it reaches its minimum. The following are the mean maxima and minima for coincident periods:—

	Jan.	June.
Madras	29·998	29·668
Bombay	22·914	29·633
Calcutta	29·962	29·506
Aden	29·915	29·606

On the 5th of February, and two following days, the barometer at the first three localities indicated the extraordinary mean pressure of 30·200 inches.

KEW OBSERVATORY.

MR. RONALDS has presented to the British Association, his annual Report "On the Kew Observatory," from which it appeared that the observations have, from the deficiency of applicable funds, been discontinued since the meeting in 1848; but a sum having been then voted for completing certain experiments in progress, and another sum for the reduction and discussion of the series of electric observations which commenced in August, 1843, and terminated in 1848, the last year's work has been principally devoted to these objects; and it was deemed that good service has been rendered to the modes of magnetic investigation by this employment of the Observatory. The Report proceeds to give an account, as usual, of the establishment, including a complete inventory of the contents of the building.

Then follows Mr. Birt's discussion of the Electrical Observations. A summary specification of the experiments of the year was given, viz.: 1. On the management of the light admitted into Mr. Ronalds's camera by suppressing his usual condensing lenses, and bringing the index of the magnet nearer to the lamp, by which means the time required for producing an efficient image on the paper was materially diminished. An improvement on Count Rumford's polyflame lamp was useful for heightening the brilliancy of the flame itself. 2. Experiments intended to determine the comparative advantages of a slit in a shield and the index which had been hitherto used. The slit was found far preferable in the case of large and sudden excursions,—such as those occurring in Canada. 3. On the comparative advantages of the *Daguerréotype and Talbotype* processes. The former was found for

all these uses preferable, confirming Col. Sabine's anticipations. Several experiments, more or less successful, on modes of copyin impression of the mercury on the plate,—in which assistance derived from Mr. Malone. 5. Experiments of etching, either b mezzotinto or dry-point method, on the daguerreotype plate i with a view to the circulation of the original observations, the remaining serviceable for a few more mercurial impressions. 6. periments suggested by Dr. Lloyd for procuring the plate on the kind of zero line for measuring ordinates, as Mr. Ronalds had the first procured upon paper, &c. 7. Experiments for the con tion of an instrument for measuring ordinates of magnetic and curves from the above-mentioned zero line, or in other instance Experiments for the improvement of daguerreotype apparatus f process of cleaning, polishing, and coating plates used for the poses of these observations, with some other experiments of les sequence.

The volume, further, contains the full details, illustrated wi plates, of the apparatus, resulting in part from the foregoing se experiments, and sent by Col. Sabine to the Toronto Observat immediate use. An advantage of this arrangement is, that no *metric* expansion or contraction can have sensible effect on t quired results. Mr. Ronalds's correspondence on the subject tricity and magnetism seems to have had beneficial results. last place is presented, as usual, a list of proposals for new ments at Kew, extending to twelve heads,—one of the most ur which Mr. Ronalds considers to be the prosecution of expe commenced at the observatory in 1845, and suspended for funds, on the important subject of frequency of atmospheric city; a subject unaccountably neglected since the observat Beccaria, at Turin, in the middle of the last century, and one seems to Mr. Ronalds to grow in importance with the growth chemical and magnetical information. Others of these propos brace a course of inquiry in magnetism, electricity, and meteorological phenomena, all requiring only a sufficient obse staff to be beneficially carried out.—*Athenæum*, No. 1142.

CONTINUANCE OF SOLAR SPOTS.

Mr. Pringle, of Edinburgh, in a letter to the *Philosophical zine*, No. 226, describes a Succession of Spots, or Clusters, the Sun, on December 8 and 13; and concludes his communic follows:—

From what has been observed, I am inclined to conclude t Solar Spots may last much longer than we are yet aware of; a the want of sufficient observation alone has restricted our kn of the true extent of their duration. No doubt it would occupy the entire time and undivided attention of any individual to fol their phases and developments so as to satisfy the objects re but an Association, I am informed, has recently been instituted express purpose of observing and studying the spots in a more

matic manner than has hitherto been attempted; and to whose united labours, therefore, if published, we may look for a mass of new matter and interesting information on the subject, such as could not be expected from mere individual and isolated observation.

The spots seem almost the only inlets whereby to penetrate, if possible, into the sun's physical character, with the exception of the phænomena connected with eclipses; and, however volatile and changeable they may appear, there is no good reason to despair of yet reducing their evolutions to a system, and even thus detecting laws which may bear upon the solution of the general physical organization of the sun.

EASY MODE OF MEASURING SOLAR OBJECTS.

Mr. Pringle, of Edinburgh, observes in the *Philosophical Magazine*, No. 228: "I am not aware whether the expedient is generally known of Measuring the Solar Spots by placing a graduated glass scale on the diaphragm of the eye-piece, and casting the sun's image upon a white ground. The divisions of the micrometer become thus more palpably distinguished, and the excess covered by the spots is more accurately estimated by the eye than when looking direct through the telescope. In this way also an angle can be measured in any direction by merely turning the eye-piece round on its axis. It greatly saves the eye-sight, and is serviceable when only brief glimpses are to be obtained, and expedition is required. Although perfect accuracy may not be attained, it may serve at least for general purposes."

UNIVERSAL SUN-DIAL.

This Dial, made by Mr. Sharp, of Dublin, and exhibited to the British Association, consists of a cylinder, set to the day of the month, and then elevated to the latitude. A thin plane of metal in the direction of its axis is then turned by a milled head below it till the shadow is a minimum, when a dial on the top shows the hours by one hand, and the minutes by another; and it appears that the time can be thus obtained to the precision of about three seconds.

LARGE REFLECTING TELESCOPES OF THE EARL OF ROSSE AND MR. LASSELL.

We quote the following details from a Lecture delivered to the Astronomical Society, by the Astronomer-Royal, on the large Reflecting Telescopes of the Earl of Rosse and Mr. Lassell. The details relate to the form and mounting of the telescopes:—

"Lord Rosse's Telescope is a wooden tube, its interior diameter exceeding 6 feet in every part, being at the middle about 7 feet, and nearly 50 feet in length This is fixed to a cube of 10 feet, which has folding doors on that side which, when the telescope is horizontal, the upper side (at which side the fixed frame supporting the mirror is introduced, as has already been said), and which carries the fixed frame by three large screws in that side of the cube which is opposite the mouth of the telescope. To this side of the cube is attached the universal joint by which the lower end of the telescope is connected with a fixed support, the joint being a few feet below the general surface of

the ground. On each side (east and west) of the telescope is an e
pier of solid masonry, about 70 feet long, in the north and south direc
tween 40 and 50 feet high, and in its thickest part nearly 20 feet thick.
of these dimensions are taken from actual measure.] The fixed su
nearer to the north than to the south ends of these piers. Near th
the pier, on the interior faces, in the east and west plane passing thr
universal joint, are two cranes with pulleys (the turning crane being
than suffices to carry a large pulley, whose edge is in the vertical
the crane); over these cranes the chain passes which are attached to
scope; and to the lower ends of the chains, after they have pas
pulleys on the walls, are attached the counterpoises, weighing about
each. These counterpoises are not allowed to depend freely, but
nected by bridle-chains with wooden horns that project from the n
of the piers; the effect of this arrangement is, that when the telesco
nearly horizontal, and the force required to support it is very
weight of the counterpoises acts very nearly vertically on the chai
entirely effective for the support of the telescope; but when the te
considerably elevated, and less supporting force is required, the we
counterpoises is supported in a great measure by the bridle-chains
little tension is given to the supporting chains. For the sake of
some slight defects in the laws of tension thus produced, and a
sake of constantly producing a small tendency in the telescope t
south horizon, other counterpoises, in a pit south of the fixed s
brought successively into action as the telescope is raised. Th
only a comparatively small and very manageable tendency of th
towards the south; and this is supported by a light chain which pa
pulley on a bar connecting the horns before mentioned (the pull
the direction of a polar axis passing through the lower universa
the motion of the telescope, therefore, for a given length of the c
equatorial); and this chain is shortened or lengthened, and the
thereby raised or depressed. by a windlass a little way north of th
port. Upon the inner face of the eastern pier is an iron arc of a
which slides a runner connected with a rod that passes through
the telescope tube and near to its mouth, and is there racked
with a pinion. By the movement of this pinion, the distance of t
from the pier is altered, and thus a motion in hour-angle is giv
south ends of the piers there are strong ladders, upon which
counterpoises) there slides a stage; upon which stage a small ob
travels east and west: this is used for observing, so long as the m
telescope is below the end of the pier. For great elevations, th
western pier being shaped by slopes so as to approximate to a c
there are mounted upon it curved galleries, which are carried
that run above and below pulleys fixed to the top of the pier; ar
ries are carried out by rack-and-pinion work, to approach the
telescope. It is intended to give the power of observing as far n
pole; but at present the galleries only extend to the zenith. The
Newtonian, the minor axis of the small mirror being about six
the observer looks into the side of the tube.

"Mr. Lassell's tube is of sheet-iron; and this tube is not car
diately by the mounting, but is inserted in a long box of cast ir
it can be turned round its own axis. This movement is necess
the eye-piece exactly in the same side-position in all directions
scope, and also to cause the edgewise support of the mirror to a
the same way. The long bar is mounted equatorially, the polar
in two bearings below the declination axis, and carrying an hour-
which are fixed two supports, in which turn the two pivots of the
axis of the long box. The telescope is Newtonian, the eye-tube l
side; but the smaller dimensions of the small mirror (a diam
inches only being required) enable Mr. Lassell to use the reflexio
ternal surface of a glass prism, by which much more light is re
by a metallic reflector. At first much annoyance was caused by
tion of dew on the glass; but this was remedied by attaching
carrying a small piece of heated lead; and when proper attention
the inclosure of the lead, no inconvenience is sustained from the

isturbing the air in the tube of the telescope. The whole is revolving dome thirty feet in diameter, and the observer is bservation on a stage which is carried by the dome."

both these telescopes have been presented to the Astro-ety by the Astronomer Royal. It is understood that l Rosse's telescopes, speculum apparatus, &c., were con-;r Mr. Airy's directions, *from memory*,—and prove to y accurate.*

MODEL OF THE MOON.

IT has exhibited to the British Association, a Model in ·t of the Moon's surface.

:wster observed, this model is an accurate representation s surface as it appears through a Newtonian telescope of nd 9 in. aperture, under a magnifying power of about 250. olcanic crater which forms the principal object in the ;ceived the name of Eratosthenes. It is about thirty ieter, and stands at the end of a lofty range of mountains the centre of the moon's disc. A hilly district, rising hree lofty peaks, runs upwards from Eratosthenes, con-:h what appears to have been an ancient crater now filled ng the edge of this crater, and descending from it towards .y be seen a long line of minute volcanic cups, which are nallest objects visible with the instrument by which the were made. The whole is represented as seen with an piece, and the model ought to be held in an oblique light, iew it to an advantage. Dr. Robinson mentioned that had modelled the crater with the 3 ft. reflector, power irse, on a much larger scale; but he bore witness to the correct representation which the model presented. In : directed attention to the interior terrace, and showed its 'hat is exhibited in some of our own volcanos when the :rater till its sides yield to the pressure, and then escapes, el terrace round its sides. He hoped Mr. Blunt would bours, and give as many of these craters as might be in

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THE NEBULAR THEORY.

Prof. Baden Powell has read to the Royal Institution, ie Nebular Theory, which has been a subject of unusually ;cussion at the present day; probably from a supposed th topics of which it is really independent. In particu-veries of Lord Rosse have been dwelt upon with much eing imagined wholly subversive of this theory; an idea from complete misapprehension of the subject. In at-give a summary of the real nature and evidence of this ;ssential to distinguish the case of the so-called sidereal

*binson's Report of the condition of Lord Rosse's Telescope, in *of Facts*, 1849, p. 142.

nebulæ from that of the nebular origin of the solar system; pearing like patches of bright cloud to the eye, or to low resolved into clusters of minute stars by higher powers. L observations have extended greatly this process of resolutio expressly introduces a caution against assuming that this tinue without limit. And while his telescope resolves mar objects, it at the same time brings into view new nebulous them; as *e. g.* in the dumb-bell nebulæ in Vulpecula. Sir Joh while he considers in most cases the distinction rather optic sical, yet observes, as a law resulting from his observations masses which tend to a round or elliptoidal form are mostly and those of an irregular filmy form not so, and perhaps distinct. These and the stars with a nebulous haze appe under all powers, and are probably really unformed sidere

The general result is (1) the real existence (under all magnification) of different stages of condensation; and (dency of a nebulous mass to condense to a number of ce milky way appears to be a sidereal cluster, which includ the filmy nebulæ and nubulous stars, and contains the double stars, and our solar system. The analogy of tl therefore, not with sidereal clusters, but with their compo parts. The nebular views of Sir W. Herschel were app La Place solely as giving an analogy in the progressive s formation of masses by condensation in other cluster Place's theory of the solar system is derived from the c that all the planetary and satellitary movements so clos each other in all their conditions that one common caus produced them. While he found such a cause in the con a heated, vaporized, or nebulous mass, by cooling throw cessive rings, which, under the influence of a variety of a have a tendency to condense to several centres, toward rush of matter (unless, most improbably, taking place in posite directions) must produce a rotatory motion. The pl been consolidated, portions of the nebulum medium still form of the zodiacal light or solar atmosphere, the nebulo comets, and the etherial medium which offers resistance to tl The process of condensation to a nucleus has its real exa heads of comets, as well as in the nebulæ of two of the a most probably in the cosmical matter from which meteor densed. Comets have been expressly spoken of by the la as detached remains of the original nebulosity, which "w has saved from the extreme condensation which the plar perienced;" as having originally been projected in parabo perhaps, from the resistance of the uncondensed nebu made to return in limited orbits; as "a link between the past states of our system, showing in their obedience t gravitation a presumption that that law has been unalter system was nebulous, and now holds good in the nebulæ v *unchanged.*"

The geological doctrine of central heat, and the once fused state of the earth, render it probable that the same heat had at an earlier time vapourized its matter Objections have been raised against this theory on the ground of the errors pointed out by Sir J. Herschel in certain calculations of M. Comte in *his* view of it; but the theory itself is independent of these speculations. An apparently more formidable difficulty is the fact that the times of the rotation of the sun or of the earth are not the same as those of the planetary and lunar nebulæ, from which the planets and moon respectively were thrown off, as well as that the orbits are inclined to the sun's equation. But these deviations would obviously result from the action of the dense resisting medium in which the bodies would begin to move, accelerating the motions of the planets and satellites, and retarding that of the sun or primary; while the latter would, on the other hand, be accelerated by the law of areas to a greater degree than the retardation; and from the existence of condensing forces acting in different directions to give the primitive impulse.

Much needless dispute has arisen from mistaken ideas of the object and importance of such speculations; which ought to be regarded merely as plausible philosophical conjectures to give a turn to inquiry and correct ideas, but which are neither to be contended for as realities, nor condemned as unsound or mischievous. The sole question is the preservation of analogy and consistency. Equally unfounded are the reflections somewhat cast on these speculations as injurious to the doctrine of final causes. All investigations of final causes, or rational natural theology, implies essentially the tracing out of the successive steps and secondary means of those operations from which a Supreme cause is inferred. The further the train of physical causes can be traced, the greater and more accumulative the proofs of a Supreme moral cause. Such a theory as the nebular (in proportion as it may be conceived to be confirmed) adds precisely in this way to the evidence of unity of design evinced by the harmony of law and order throughout creation.—*Athenæum*, No. 1118.

REPULSION OF THE OPTIC AXES OF CRYSTALS BY THE MAGNETIC POLES.

Dr. Faraday has communicated to the Royal Institution, a paper "On Plücker's Repulsion of the Optic Axes of Crystals by the Magnetic Poles." Dr. Faraday has shown that, when a crystal of bismuth and other crystalline bodies is suspended between the poles of a magnet, it tends to assume a direction with respect to the magnetic axis which is constant for the same body, and by a force which he has termed the *magne-crystallic force*. Prior to these researches, Prof. Plücker, of the University of Bonn, was investigating influences exerted by the magnet or organic structures and fibrous bodies. These experiments led to discoveries respecting the magnetic condition of crystals, which he published in *Poggendorff's Annalen*, Oct. 1847, and also reported to the British Association at Swansea. These formed the subject of *Dr. Faraday's present discourse*. In double refracting crystals, such

as tourmaline, Iceland spar, mica, red ferro-prussiate of potass, there are certain directions in which light passes unaffected. T directions are called *optic axes*. Now Professor Plücker states That when any crystal having a single optic axis is placed betw the poles of a magnet, this axis is repelled by the poles. It shown that in uniaxial crystals, whether magnetic, as tourmaline, diamagnetic, as rock-crystal and calcareous spar, the position sumed by the crystal freely suspended between the poles of the mag was such that the direction of the optic axis was in, or parallel wi the equatorial plane of the magnetic field. 2. When the crystal h two optic axes, the repulsion is chiefly exerted on the line which in tersects the acute angle formed by them. The equatorial position this line was shown in a crystal of red ferro-prussiate of potass, whi is magnetic. Dr. Faraday at first considered the results obtained by Plücker and himself as entirely different in their nature—his own were not results of attraction or repulsion, but of a force giving rela tive position only; but he now thinks that Plücker's results are of th same kind, not being due to any repulsive power between the opti axis and the magnetic poles. M. Plücker has further noticed th the three conditions of magnetic power (magnetic, diamagnetic, an magne-optic) do not rise and fall at an equal rate of increment or d crement,—that if, for example, there be any variation of force (from a change in the strength of the battery, or in the distance of t poles) the diamagnetic force both increases and diminishes faster t magnetic or magne-optic force; while, on the other hand, the m netic force increases and diminishes faster than the magne-optic for In conclusion, Dr. Faraday noticed that the facts by which Pr Plücker had exhibited light as an indicator of the internal conditio crystallized matter, had a direct and important relation to its own vestigation on the magnetism of light. For, as he had already show when a piece of heavy glass is placed between the poles of a magn it rotates a ray of light; but that lines or planes of no optic act then exist in the magnetic equator. Now these directions of no tion, which are artificially and temporarily produced in the glass the magnet, are naturally and permanently present in a crystal; a crystal, when suspended there, moves until these lines also coin with the magnetic equator. The experiments which exhibited optic axes of crystals were made on a large scale, and with singu beauty, by Mr. Darker, jun.

CIRCULAR CRYSTALS.

Sir David Brewster has communicated to the British Asso tion, a brief notice of his experiments. Mr. Fox Talbot first stud the phenomena of this class of Crystals as exhibited on those produ by a mixture of borax and phosphoric acid; and Sir D. Brewster hibited drawings of this phenomenon which has been presented to by Mr. Fox Talbot. In the course of his own inquiries, he disco a large number of bodies which yielded circular crystals, wh

led into two classes, positive and negative, including oil of mace phenomena of which he had previously described in the *Phil.* ns. for 1814), animal fat, wax, &c., in which it is very difficult to nguish circular from quaquaversal polarisation.

NOMENA OF BINOCULAR VISION. BY MM. L. FOUCAULT AND J. REGNAULT.

n a beautiful investigation on the vision of objects of three dimen- ns, Mr. Wheatstone states that when two visual fields, or the cor- onding elements of the two retinæ, simultaneously receive impres- ns from rays of different refrangibility, no perception of mixed ours is produced. The assertion of this able philosopher being posed to the opinion of the majority of those who have attended to same subject, we have thought it useful to repeat, modify, and ex- d these experiments. The Stereoscope of Mr. Wheatstone offered imple means of disentangling these delicate observations of all com- ation capable of injuriously affecting the accuracy of the physiolo- l results.

he recomposition of mixed tints by means of vibrations produced he retinæ by different coloured rays is beyond doubt. But the ess varies in a remarkable manner in different individuals; it is ible that it may be exceedingly weak in some persons, and excep- ally null in others.

he tendency of one of the eyes to become inattentive in this kind periment is very remarkable when the whole extent of the visual s is uniformly lighted up by different coloured rays. If we cause mpression to be made on limited and corresponding parts of the æ, the power of the attention constantly favours the recomposi- . If two coloured rays susceptible, on reaching a white screen, roducing a mixed tint produce the same sensation when acting rately on the corresponding portions of the retinæ, it seems pro- e that two complementary rays will produce the sensation of white ffecting the corresponding elements of the sensitive membrane.

o prove this recomposition with respect to a great number of plementary tints, and present the phænomenon in all its clear- , we arranged the following experiment:—We affixed to the ste- cope two plane mirrors, forming a variable dihedral angle, the ical edge of which is placed symmetrically in relation to that of glasses of the stereoscope. The vertical uprights bearing the oves for the purpose of introducing the images are perforated by large circular apertures. In the grooves are placed two glasses, which are pasted two circular screens of white paper of the same , and of a diameter less than that of the apertures. Two large inous rays of complementary tints, obtained by chromatic polari- on, are directed horizontally upon the plane mirrors which reflect m; they traverse the glasses of the grooves which remain dark; *when reflected irregularly* on the circular screens, they give two *ured discs, exactly identical* as to form and extent, which be- *the images conveyed* by the stereoscope to the corresponding

elements of the retinæ. We might, by means of an appropriate disposition of the polarizing apparatus, successively present numerous complementary tints, vary at the same time the intensity of the two coloured images, and modify the intensity of one or other of the images separately.

The following are the physiological results we have observed. When the corresponding elements of the retinæ receive an impression at the same time, the alternations of activity or inertness of one of the eyes is generally manifested at the commencement of the experiment, and sometimes one of the tints is perceived, and at other times its complementary one; but after a duration of observation, varying considerably according to the individuals, only a single white circle is seen.

When the eyes are in some degree accustomed to this unusual mode of impression, the tendency to recomposition becomes so energetic in some persons, that the screens might present successively all the complementary tints which the apparatus furnishes without there being any sensation corresponding to the colours; only white light is seen.

On diminishing the intensity of one of the colours, the other remaining constant, recomposition still takes place; but the white disc appears to become covered more or less strongly with the predominant tint.

If the intensity of the complementary rays be varied in the same manner for the two collections of rays, the recomposition is made with greater facility at the commencement of the observation, as their intensity is more moderated.

Of the complementary rays which we have examined, the sensible blue and the yellow tints are best adapted for the experiment, and immediately furnish the sensation of white.

We believe that this phænomenon is owing to the circumstance, that the accommodation of the eyes being the same for these groups of rays, according to the portions of the spectrum which they occupy, the efforts necessary to produce recomposition are on that account considerably lost.

We find that, saving exceptional cases, the sensation of white light may be produced by any two complementary chromatic impressions in each of the eyes; that the sensation solely of white arising from two complementary rays is independent of any mutual action of these rays externally to the visual apparatus; that the luminous impressions produced on the retinæ retain their properties even to the innermost recesses of the brain.—*Comptes Rendus.*

BINOCULAR CAMERA, BY SIR D. BREWSTER.

This instrument affords to artists a ready mode of obtaining drawings of full length both of colossal statues and of living bodies or fixed structures,—which pictures can then be exhibited as solids by the stereoscope. As the Camera required for this purpose must have two lenses of exactly the same focal length, in order to form by the *Daguerreotype* or Talbotype processes the two pictures required with

mathematical precision, Sir David has constructed this double camera by dividing a suitable lens into two semi-circular lenses, each of which will form an image exactly like that which the entire lens had formed, though with less light. These semi-lenses, placed at the proper distances from each other and from the object, give the two pictures as required for producing the effect of relief when seen by each eye at once in a stereoscope.—*Proceedings of the British Association.*

THE PHANTASCOPE.

Prof. Locke, of Cincinnati, has invented an instrument, which he calls *The Phantascope;* by means of which some very curious optical phenomena can be easily exhibited, and many of the laws of binocular vision illustrated. The instrument is very simple. It consists of a flat board—base about nine by eleven inches—with two upright rods, one at each end; a horizontal strip connecting the upper ends of the uprights, and a screen nearly as large as the base; this screen being adjustable to any intermediate height. The top strip has a slit one fourth of an inch wide, and about three inches long, from left to right. The moveable screen has also a slit of the same length, and about an inch wide. If two identical pictures—say of a flower—about an inch in diameter are placed on to the right, with the other to the left of the tabular base, and about two or three inches apart, and a flower-pot or any other object is painted at the centre of the moveable screen, its top being even with the edge of the slit—and an observer looks down through the upper slits, with both eyes steadily, to a mark in the flower-pot—a flower precisely similar to those painted on the base board, but of half the size, will appear as if growing from it. Numerous similar results may be obtained with this instrument; and many of the effects of the intercombination of colours are stated to be most curious and instructive. Those who are acquainted with the Stereoscope of Prof. Wheatstone will perceive that the Phantascope is but a simple and ingenious modification of that beautiful instrument. They both alike serve to illustrate the phenomena of single vision with a pair of eyes.*—*Scientific Gossip, in the Athenæum,* No. 1156.

INFLEXION OF LIGHT.

A communication from Lord Brougham has been read to the British Association, by Sir D. Brewster. His Lordship's experiments were made at Cannes in Provence, by an apparatus executed by M. Soleil of Paris, and with the aid of a heliostate for fixing the sunbeam in one position during the day. The results obtained by Lord Brougham are: that when a pencil of divergent light has suffered inflexion by a metallic or any other edge, of any form or substance, it exhibits different properties on its different sides when submitted to the action of a second *inflecting* edge.

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* *The Stereoscope is described in the Year-book of Facts*, 1839, page 88.

THE ALBUMINIMETRE.

M. Edmond Becquerel has constructed an apparatus founded on the same principles as the Polariscope of M. Biot, which he calls an *Albuminimètre*. By an ingenious disposition of its parts, the intensity of the luminous image which gives by its variations of brightness the index of rotation, is more considerable. By this new polariscope, the author has proved that the albumen in solution is the serum of the blood, and in a great number of organic liquids gives a left-handed polarization to the light: the intensity of this deviation being in proportion to the quantity of albumen contained in these liquids. This is another of those practical applications of the phenomena of polarized light which are as valuable as they are curious.

PHOTOGRAPHIC REGISTRATION OF MAGNETOMETERS.

The Annual Report of the Astronomer-Royal on Greenwich Observatory, states

The success of Mr. Brooke's Photographic Apparatus for Making the Magnetometers self-registered to be decisive. On this subject Mr. Airy observes,—

"Although the attendance to the various parts of the photographic operations is troublesome, yet there is only one circumstance attending them which can be described as annoying—namely, the liability of the camphine lamps to smoke. It has for some time been with me a matter of difficulty how to avoid this nuisance; for the light of oil lamps, or that of coal-gas, will not make a sensible trace on the photographic paper. Mr. Brooke, however, at my request kindly undertook a series of experiments, and he found that coal-gas, charged with the vapour of naphtha, makes a trace as nearly as possible similar to that of camphine. I propose, therefore, now to introduce gas to the Observatory; in the first instance it will be laid only for the photographic lamps; but it will, doubtless, soon be used for many applications in the astronomical as well as in the magnetical and meteorological department."

THE REV. PROFESSOR POWELL ON IRRADIATION.

The phenomenon known by the name of Irradiation is best exhibited by the method of M. Plateau, which forms the basis of all the author's experiments; and which consists of a card or lamina cut so that a long parallelogram has one half cut out and the other left, the portions at the sides being cut away. Thus, the effect is seen doubled either by transmitted or reflected light. It is well established that the effect increases with the intensity of the light. It is also evident that it decreases rapidly towards the edge of the enlarged surface. The effect has been ascribed by most writers to a peculiar kind of physiological affection of the retina. But (allowing for the effect of *dazzling*, contrast, &c.) the author has shown that this is not the case; *since exactly* the same effect is produced in an artificial eye, or camera *obscura*. The effect has also been tried photographically in some *cases*, and especially in direct sunlight, with perfect success; in others

bout effect. But the most effective photographic rays are not the it illuminating, and may therefore not be equally subject to this lification. These phenomena appear to be simply cases of the rged focal image of a luminous point, which is a well known result h of theory, as investigated by Mr. Airy,* and of observations, as s in the discs of fixed stars under contracted apertures. The effect the eye is diminished, and may be totally destroyed, by the inter-tion of a lens, even in the brightest lights. This is explained by diminution of intensity in proportion to the superficial magnifica-, which is most effective at the edges. In telescopes there is a fold effect of this kind; one at the focus of the eye, another at that the object-glass. The former may be neutralized by the magnifica-n of the eye-piece. The author has tried many experiments on image of a card, cut as above, seen in a telescope under apertures various degrees of contraction, which appear to accord closely with phenomena of the "diffraction of the object-glass." It also ows that there must be a limit to the increase of the enlargement he image, dependent on the diminution of light when the aperture ontracted beyond a certain point, which will vary in each indi-al instrument. The author suggests a method of measuring the unt of irradiation under any given conditions of light, by viewing measuring micrometrically in a telescope the image of a card cut ove, under the given light, placed at the focus of an object-glass site to that of the telescope, and connected with it by a tube. retically, irradiation would explain those singular phenomena in eclipses and transits of the planets, of the connexion of the of the dark disc by *necks* or *threads* to that of the sun: as also e apparent projection of a star on the *bright* limb of the moon, mply overlapping the star from irradiation. But the difficulty in iese phenomena is their appearance in some cases, and not in s under circumstances apparently similar.—*Proceedings of the ish Association; Athenæum*, No. 1145.

MEASURING AND CORRECTING THE ASTIGMATISM OF A DEFECTIVE EYE.

R. G. G. STOKES has stated to the British Association, that, les the common defects of long sight and short sight, there exists fect, not very uncommon, which consists in the eyes refracting ays of light with different power in different planes; so that the regarded as an optical instrument, is not symmetrical about its

This defect was first noticed by the present Astronomer-Royal, paper published about twenty years ago, in the *Transactions* of Cambridge Philosophical Society. It may be detected by making all pin-hole in a card, which is to be moved from close to the eye m's length; the eye meanwhile being directed to the sky, or any it object of *sufficient size*. With ordinary eyes, the indistinct e *of the hole remains circular* at all distances; but to an eye

* Camb. Trans. v. 283.

having this peculiar defect; it becomes elongated; and, when the c is at a certain distance, passes into a straight line. On further amining the card, the image becomes elongated in a perpendic direction; and, finally, if the eye be not too long-sighted, passes i a straight line perpendicular to the former. Mr. Airy has correc the defect in his own case by means of a spherico-cylindrical lens, which the required curvature of the cylindrical surface was calcul by means of the distances of the card from the eye when the two fc lines were formed. Others, however, have found a difficulty in p venting the eye from altering its state of adaptation during the m surement of the distances. The author has constructed an instrum for determining the nature of the required lens, which he described

CLASSIFICATION OF COLOURS.

PROFESSOR J. D. FORBES has read to the Royal Society of Ed burgh, a series of hints towards a Classification of Colours; in wh he thus explains how he has availed himself of the aid of the imme collection of artificial enamels employed in the Vatican fabric mosaic pictures, as offering an unrivalled opportunity of forming s a classification.

This gigantic establishment was founded about two centuries for the express purpose of adorning the interior of St. Peter's w the elaborate mosaic pictures and ceilings which astonish every visit The whole interior of the stupendous dome is incrusted with mo patterns and pictures; of coarse execution, indeed, but such as suits t the vast distance from which alone they can be properly viewed; wh the finished mosaic works which adorn the altars, reproduce in unfad colours, and with consummate skill in shading, the *chefs-d'œu* of Raphael, Domenichino, and other artists preserved in the Vati gallery. The material is a soft and fusible enamel, and the format of 18,000 tints was effected by an ingenious artist named Matte The rough cakes of enamel are preserved in separate cupboards pigeon-holes, surrounding a hall of great length appropriated to purpose by Pope Pius VI. But the main intention of the work b completed with St. Peter's, it has not been thought worth whil preserve the integrity of the collection (which, indeed, would be easy matter); and it is certain that though still reputed to con 18,000 modified colours, the effective number is vastly smaller.

Professor Forbes was fortunate enough, in 1844, to procur selection of specimens of the leading colours of the Vatican mos consisting of an assortment of no less than 941 pieces of mos classified in separate packets. They presented a great prepondera of indefinite colours, and a great deficiency of many of the livelier brighter primary and secondary colours. But particularly wh packets were composed of specimens scarcely sensibly differing fr each other. This last circumstance was probably occasioned by carelessness and indolence of the workmen who selected them. T former occurrences might naturally be expected in a collection co structed for the purpose of imitating paintings, in which, as is w

known, optically pure colours are almost never used; but their effect is invariably produced by skilful contrasts. Many of the suites of indefinite colours are exquisitely beautiful. With Mr. Hay's assistance, Prof. Forbes selected a sufficient number of distinct hues to represent tolerably Mayer's triangle of colours; but the great mass of colours being only detached suites, it was impossible to combine them into a connected whole. As there is no doubt, however, that the collection is one which faithfully represents the colours chiefly used by artists, it may not be uninteresting to copy the catalogue forwarded, with the local names, and the principal denominations on the scale of nomenclature proposed in this paper, which they include.

		Local Names.	*Technical Names.*
100 specimens.		BIGI.	Tints of yellow-gray, and tints of gray.
100	..	CARNAGIONI.	Tints of orange-gray (brown), reddish-yellow gray, reddish-purple gray, purple-gray.
60	..	GIALLI.	Tints of yellow-gray and reddish-yellow gray.
20	..	GIUGIOLINI.	Orange passing into red and yellow.
60	..	LACCHE.	Grayish-red, reddish-gray, yellowish-gray, purplish-gray, *shades* of purplish-gray.
60	..	LEONATI.	Yellow-gray passing into purple-gray, *shades* of purple-gray.
60	..	PAVONAZZI.	Gray-purple and *tints* of ditto.
76	..	PORPORINI.	Red and grayish-red.
172	..	SCORZETTI.	Tints of yellow, *tints* of orange, *tints* of yellow-gray and of red-gray.
91	..	TURCHINI.	Tints of blue, *tints* of purplish-blue, grayish-greenish-blue.
142	..	VEROLI.	Tints of green-gray, *tints* of blue-green.

941 Total of specimens received.

This number of specimens would have been sufficient to make a complete series of colours; but, as has been said, they were very deficient in the more positive hues.

NEW PHENOMENA OF LIGHT AND ACTINISM.

MR. HUNT has communicated to the Royal Institution, a paper "On some New Phenomena of Light and Actinism." The chemical change produced in chloride of silver when exposed to the action of the sun's rays, by which powerful chemical affinity is broken up, chlorine liberated, and silver in a state of fine division left, was selected as an exemplification of the actinic force, which was the subject of consideration. This chemical change takes place in white light, and hence all those photographic phenomena which have created so much interest have been referred to luminous power. If, however, we examine the conditions of light as analyzed by the prism—presenting not seven coloured bands, as stated by Sir Isaac Newton, but nine as proved by recent experiments—it is found that these coloured bands possess opposite properties. For instance, the chloride of silver will not darken in the mean luminous ray of the spectrum; nor will it darken either at that end which gives the greatest calorific effect, or at the end which is embraced by the lavender ray, usually regarded as representing the most chemically active part; consequently, we find

three points in the spectrum which will not produce any change in chloride of silver. Where we have the most light, and at two extremities where the light ceases to affect the human eye, and also laterally, bands are exhibited which show the same physical conditions; and thus it would appear that the *circle of light* is not the agent producing this peculiar alteration. Regarding, as appears natural, the ordinary prismatic spectrum as the representation actually of two spectra consisting of but three colours—red, blue, and yellow, which is shown by the re-appearance of red light in the blue, and of yellow light in the lavender ray, which blue light appears again at the least refrangible end in the extreme red or crimson ray,—we have an explanation of the result above mentioned; and the want of chemical action is shown to arise from the operation indeed of the most luminous bands. By absorbent media, as coloured glasses and fluids, these effects were more fully explained. The most remarkable results have, however, been lately obtained by the use of coloured media; and it has been shown that every luminous ray, independent of colour, may be made to protect chloride of silver from that chemical change which is induced by the direct action of diffused daylight—the portion upon which those rays fall being actually preserved as a white space, every other part being blackened.

It was contended that no hypothesis of interference would explain this result, which more decidedly proved than had hitherto been done the wide difference between the phenomena of light and actinism. The fact that luminous effect—phosphorescence—was produced by the blue rays of the spectrum appears to oppose this view; but when we find that almost any variety of glass prevents this phenomenon, and that in like manner electricity was interrupted, it appears more rational to refer phosphorescent phenomena to some peculiar electric excitation.

The action of the solar rays on the development of vegetable life was then explained, and the following conclusions suggested as the explanation of experimental results frequently repeated. 1. *Germination*, which will take place in the dark, is quickened by the actinic force, and retarded and often stopped by the luminous power.—2. *Lignification*. The decomposition of carbonic acid by the plant is due to some excitement of luminous power, and is stopped by the actinic force.—3. *Formation of Chlorophylle*. Due entirely to the luminous rays.—4. *Flowering and Fruiting*. Dependent upon the action of the thermic or parathermic rays of the spectrum, as distinguished from both the luminous and actinic forces.—5. *Motion of Plants*. Bending to the blue light, and receding from the red, proving the excitement of actinic force.—*Athenæum*, No. 1122.

POLARIZATION OF HEAT.

MM. F. de la Provostaye and P. Desams have, through M. Regnault, presented to the Academy of Sciences at Paris, a memoir upon the Polarization of Heat. Pursuing the investigations of MM. Bérard, Melloni, and Prof. Forbes, they have satisfactorily resolved

l important problems which prove that heat obeys the same laws ıt with remarkable exactness. They arrive at the following con-ıs :—1. That the heat which traverses Iceland spar is divided vo bundles of equal intensity, completely polarized in the plane principal section, or in a perpendicular plane. 2. The law of , that the intensity of a ray completely polarized is divided be- the ordinary and extraordinary images which are produced in sing the plates, is as applicable to heat as to light. 3. That the ons which prove the intensity of polarized heat in its reflexion glass, under different incidences, are exactly represented by the le which Fresnel has given for light, admitting that the solar ıas traversed the prism at an index but slightly different from 4. That there is the most perfect resemblance between the phe- a presented on reflecting upon polished metals polarized light larized heat.

BOUTIGNY'S HEAT EXPERIMENTS.

P. H. BOUTIGNY, whose beautiful experiments on the spheroidal on of water created so much interest at the meeting of the Association at Cambridge,* has lately been pressing his re- ıs on Heat in a somewhat novel direction. He has now proved etals in a melted state have in a remarkable manner the repul- ce of incandescent surfaces, and that the tricks of fire-eaters ıjurors belong to a high class of physical facts. He says, "I ıade the following experiments :—I divided or cut with my jet of melted metal of five centimétres, which escaped by the immediately plunged the other hand into a pot filled with in- ent metal, which was truly fearful to look at. I involuntarily red, but both hands came out of the ordeal victorious. . . . . of course, be asked," he continues, "what are the precautions ry to prevent the disorganizing action of the incandescent mass? ıe hand rapidly, but not too rapidly, in the metal in full The experiment succeeds perfectly when the skin is moist, dread usually felt at facing masses of fire supplies the neces- oisture; but by taking some precaution, we may become truly rable. The following succeeds best with me :—I rub my vith soap, so as to give them a polished surface; then, at the of trying the experiment, I dip my hands into a cold solution ımmoniac saturated with sulphurous acid." The experiment n made by Boutigny with melted lead, bronze, and cast-iron.

HEAT OF, AND EVAPORATION FROM, THE SOIL.

G. BUIST has communicated to the Geographical Society of y, a method adopted by him for ascertaining the Heat of, and ation from, the Soil. The objects and details of the experi- re stated to be as follows :—"As the evaporation from a dish of water exposed to the sun, and liable to be raised to a ıture of 100° or 120°, gives no idea whatever of the amount of

* See *Year-book of Facts*, 1846, p. 188.

evaporation from the surface of the sea, large pools, or lakes, which vary but little in temperature, he was anxious to determine the amount of evaporation from the surface of wet earth compared with that from the surface of a considerable mass of water. With this view, two zinc cylinders were prepared, three feet in length, and four inches in diameter, and secured by a strong brass ring at the top and bottom, carefully turned. These contained fifteen pounds, or a gallon and a half of water each, temperature 82°, or nineteen pounds of the loose red earth, to be found associated with trap rock. When filled with earth well shaken down, they were able to take in six-and-a-half pounds of water to overflowing. Each was provided with a glass tube quarter-inch bore, connected with the bottom of the cylinder, and running parallel with it to the top: this was intended to show how high the water stood inside. The tubes were provided with scales divided into inches and tenths from top to bottom. On filling one of them with earth, and then adding water till it flowed over, that in the tube of course decreased rapidly by evaporation; but, strange to tell, after continuing to descend from noon till daybreak, it commenced immediately to rise again till 11 A.M., remaining motionless till 1 P.M., when it began to sink, and so continued descending till about an hour after sunrise, when it commenced immediately to rise, and so continued till the same hour as during the preceding day. This went on regularly for four days; each day it sank from two to three inches, and only rose half as much; the fluctuation was in all respects most perfectly regular and symmetrical." The importance of an inquiry of this kind extended over several years and wide districts is great; and the simplicity of this arrangement appears to recommend it to the attention of all who are in any way interested in solving the problems that connect themselves with meteorological phenomena.

RAPID FREEZING OF WATER.

DR. JOHN GORRIE, of Florida, has originated an invention, by means of which Water is rapidly Frozen, From the account given of the arrangement (says the *Athenæum*), it appears founded upon correct principles, involving the laws of pure mechanics, and of the physical conditions of matter.

Essentially. (says the account), it consists of two simple agents—a force-pump, in which air is divested of latent heat by mechanical compression, with an engine in which the same air is made to operate expansively, and, in the process, absorb from water to be frozen, the heat due to its increase of volume. But there are several auxiliary agents for giving this simple contrivance its highest effective utility. Thus, by the obvious arrangement of attaching the pump and engine to the opposite ends of a common beam, the mechanical power consumed in condensing air in the pump is, to a considerable extent, recovered in its expansion in the engine. At the same time, the heat evolved by the compression of the air is extinguished by a jet of water thrown into the body of the force pump by means of a smaller pump; while the heat necessary to impart to the expanding air the elasticity

and mechanical force due to its quantity and volume is furnished through a similar pump, which takes from a cistern a portion of liquid, and, after injecting it among the expanding air in the engine, returns it to the same cistern. This cistern thus operates as a reservoir of cold, and as the sufficient means of abstracting heat from water, which is to be converted into ice, and which is immersed in it, in suitable vessels, for the purpose.

Although there is much novelty in the arrangement of this apparatus, (says the *Athenæum*), the principles involved are not new. In Germany, a high-pressure engine was made to throw out water in the form of snow. In all condensed air engines the phenomena of freezing is constantly taking place; and we learn that Trevethick made several engines with the express intention of employing them to convert water into ice, and that they answered the desired end.

TEMPERATURE MEASURED BY BALLOONS AND THE BAROMETER.

There has been communicated to the British Association, a paper—"On Observations of the Barometer and Thermometer, made during several Ascents in Balloons," by Mr. Rush. We quote the following as general results:—

Temperature of the Upper Regions of the Air, corresponding to certain Barometrical Heights, as observed by George Rush, Esq., during five balloon ascents.

Barometer.	Thermometer. May, 1837.	Thermometer. Sept. 4th, 1838.	Thermometer. Sept. 10, 1838.	Thermometer. June 27, 1849.	Thermometer. Sept. 4th, 1849.	Altitude in Feet.
In.	Deg.	Deg.	Deg.	Deg.	Deg.	
30·52	—	—	60	—	74	
·22	—	—	—	—	—	
·00	60	66	—	—	—	
29·09	—	—	—	66	—	
·00	—	—	60	—	68	
28·	—	—	—	—	66	
27·	—	—	58	—	65 51	
26·	—	—	55	—	64 50	
25·	—	—	52	—	63	
24·	—	—	48	—	61	
23·50	28	—	—	—	—	6,553 for 32° fall.
23·	—	56	46	—	61	
22·40	—	—	—	54	—	
22·	—	—	43	—	54	
21·	—	53	40	—	52 46	
20·	—	—	36	—	52	
19·	—	46 *22	35	—	46	13,044 for 20° fall.
18·	—	42	30	—	—	
17·	—	39	25	—	—	
16·	—	35	20	—	—	
15·	—	25	18	—	—	
14·70	—	25	—	—	—	19,303 for 41° fall.
·30	—	18	18	—	—	20,352 for 41° fall.

It has been determined by M. Gay-Lussac, from observations made by him during a balloon ascent, in which it is stated that at the temperature of 60° Fahr., he attained an attitude of 21,735 feet, the temperature at starting having been 88°,—that it therefore decreases at the rate of 1° for 352 feet of elevation.

DILATATION OF ICE BY INCREASE OF TEMPERATURE.

Three observers have undertaken to solve this problem by independent trials made in the Observatory of Poulkowa. They have found that the *linear* dilatation of the ice for 80° R. is

0·0052356 (M. Schumacher, sen.).
0·0051270 (M. Pohrt).
0·0051813 (M. Moritz).

The probable error in this latter determination does not exceed =0·0000190. It is a result so much the more important in the science of caloric, since the only estimate hitherto known on the same subject (that of Placide Heinrich) is almost five times more considerable.

The observations made at Poulkowa shew that the dilatation of the ice is a simple linear function of temperature, and that it is equal for all possible directions in a block of ice.

The quantity of atmospheric carbonic acid increases until we reach a height of 3365·8 metres; at that elevation is the limit of a constant maximum. Farther, at greater heights, the variations in quantity of carbonic acid are less considerable than in lower places. The immediate glacier atmosphere contains less carbonic acid than the neighbourhood. The *ascending* currents of air have a greater influence in the distribution of carbonic acid than the common winds.—*Jameson's Journal*, No. 93.

DIRECT PRODUCTION OF HEAT BY MAGNETISM.

Mr. W. R. Grove has communicated to the Royal Society, a paper on this subject. The author recites the experiments of Marrian, Beatson, Wertheim, and De la Rive, on the phenomenon made known some years ago, that soft iron when magnetized emitted a sound or musical note. He also mentions an experiment of his own, where a tube was filled with the liquid in which magnetic oxide had been prepared, and surrounded by a coil; this showed to a spectator looking through it an increase of the transmitted light when the coil was electrized. All these experiments the author considers go to prove that whenever magnetization takes place, a change is produced in the molecular condition of the substances magnetized; and it occurred to him that if this be the case a species of molecular friction might be expected to obtain, and by such molecular friction heat might be produced. In proving the correctness of these conjectures, difficulties presented themselves, the principal of which was that with electro-magnets the heat produced by the electrized coil surrounding them might be expected to mask any heat developed by the magnetism. *This interference* the author considers he eliminated by surrounding *the poles of* an electro-magnet with cisterns of water; and by this

ıd by covering the keeper with flannel and other expedients, :nabled to produce in a cylindrical soft-iron keeper, when ıagnetized and demagnetized, a rise of temperature several eyond that which obtained in the electro-magnet, and which could not have been due to conduction or radiation of heat ı magnet. By filling the cisterns with water colder than the agnet, the latter could be cooled while the keeper was being the magnetization. The author subsequently obtained dis- mic effects in a bar of soft iron placed opposite to a rotating t steel magnat. To eliminate the effects of magnetico-elec- 'ents, the author then made experiments with non-magnetic l with silico-borate of lead, substituted for the iron keepers; ermic effects were developed. He then tried the magnetic ckel and cobalt, and obtained therıic effects with both, and tion to their magnetic intensity. Some questions of theory o the rationale of the action of what are termed "the im- es" and to terrestrial magnetism then were discussed; and ır concluded by stating that he considers his experiments ıt whenever a bar of iron or other magnetic metal is mag- :s temperature is raised.

MAGNETISM OF STEAM.

EUBEN PHILLIPS has communicated to the *Philosophical* ', No. 232, an investigation which has resulted from an at- ıde with a view to the better understanding of the relation electric and magnetic forces, by ascertaining whether the ı of the electric current, the nature of which, principally researches of Dr. Faraday, is very completely comprehended, the usual magnetic properties. In this Mr. Phillips was ıt the way is now open) by an unexpected phenomenon, the ' which it became of primary consequence to develope, and ms the subject of the present paper. We quote the author's ıs :—

ı these considerations, I conclude that no continuous electric ısses through or by means of the steam jet; however, many l currents may circulate in it. For instance, if we may sup- a particle of steam when brought into contact with a par- lder water developes a momentary current of electricity in a bearing some fixed relation to those particles, and then if a succession of such particles ensues, the majority of which ırly placed, we should have something answering to an ordi- ric current, and not very unlike those currents imagined in theory of magnetism. This notion accounts for the change :ction of the magnetism produced by changing the direction ım, the effect of the difference of temperature, and the mani- of *equivalency between* the steam power expended and the *'orce obtained.* But it may be well to bear in mind, that *gnetism may ultimately* come to be regarded as some func- *nary matter and* the æther. I can only look upon the

experiments (12) as going to show that magnetism is not always bound up with current electricity: I should probably have made decisive experiment on this point, but that the steam apparatus at my disposal was not sufficiently powerful.

"It is possible instances may be found on board steamers in which the compasses are much disturbed by the steam. Clouds, too, in the act of formation and passing rapidly over a magnet, may somewhat affect it."

DEFLECTION OF THE MAGNETIC NEEDLE BY THE ACT OF VOLITION.

M. VON HUMBOLDT has addressed to M. Arago a letter of the following tenor:—He says: "the fact of the experiment of affecting a magnetic needle by the alternate tension of the muscles of the two arms, an effect due to volition, is established beyond all question or doubt. Notwithstanding my advanced years and the little strength that I have in my arms, the deflections of the needle were very considerable; but they were naturally more so when the experiment was performed by M. J. Müller or by M. Helmkoltz, who are younger men. To facilitate the experiment it is advisable to plunge the forefingers into the water, and to support the palms of the hands, to enable one to brace up well the muscles of the arm which it is purposed to bring into play."

A curious and interesting experiment, due to the investigations of M. Du Bois Reymond of Berlin, and his method of performing it, are given in the *Philosophical Magazine*, No. 232.

Two papers on the same important subject will be found in the *Philosophical Magazine*, No. 233: one by M. Becquerel, and the second by M. C. Despretz.

M. Despretz observes, in conclusion: "if we are only to admit as true that which is clearly demonstrated, we think that the experiments detailed in this note show, that if the contraction of one arm gives rise to an electric current, this current is not appreciable to our present means, at least to those which we have employed.

"We are, however, far from believing that the tetanic contraction of a limb does not give rise to the decomposition of a certain quantity of electricity. The friction of the parts upon each other, and the unequally heated state of heterogeneous parts, would give rise to electric decompositions; but recompositions ensue immediately. This is, probably, the case in all the chemical actions which occur in the economy.

"Until chemistry has discovered a metal or an alloy which does not afford any current by the contact of liquid conductors, we shall always be exposed to numerous errors in researches upon the currents of animals and vegetables.

"The galvanometer is a very valuable instrument, but it requires a very large amount of skill and prudence on the part of the experimenter. If it is made but slightly sensible, it only indicates powerful *phenomena*; if it is made very delicate, it obeys the slightest *perturbating causes*. It is not impossible that a large number of experi-

ments upon the currents in animals and vegetables may merely arise from illusions; and that what is attributed to animal and vegetable currents may be nothing more than the action of liquids upon the plates of gold or platinum of galvanoscopes, or upon other different liquids. If the two plates of gold of a galvanoscope are inserted in any direction in a potato which has either budded or not, in an apple, or a cabbage-stalk, or the flesh of beef; if any two parts of the skin, slightly moist, are touched with these same plates, we have currents; if first one and then the other plate be withdrawn in succession, and after having washed and wiped it, it be replaced, the current is reversed; if the plates are more or less deeply immersed, reversions may also occur.

"It is possible that the convulsions experienced by the frog from the contact of the crural nerves with the muscles of the legs may depend only upon the heterogeneity of the liquids which moisten these parts. It is possible that the permanence of the direction of what is called the current of the frog may be owing to a different alterability of the extremities of the animal by the various solutions employed in these experiments. In the experiment as arranged for determining the true or false current in the frog, we merely require to substitute for the animal a cord of thread impregnated with common salt, and one of the ends of which has been touched with the stopper of a bottle of sulphuric acid, and the other with the stopper of a bottle of nitric acid, to reverse the current a great many times, as is done in the case of the current of the frog.

"There is one experiment upon this subject which would have a certain value without being decisive; it is that of the action of a circuit of frogs upon a magnetic needle.

"I arranged a chain of frogs in he same manner as the pairs of a voltaic pile are arranged; this chain traversed a bell-glass, beneath which a very delicate astatic needle was suspended. I did not observe any distinctly-appreciable effect at the moment at which I united or separated the extremities of the chain. Had an effect been obtained, the objection of the action of the heterogeneous moist parts would still remain.

"It does not appear tome that the existence of electric currents in frogs and plants is a perfectly proved fact. I speak openly, submitting my doubts to those philosophers who have made most interesting, and in some cases very ingenious experiments upon this subject."

This remarkable observation made by Du Bois Reymond, that an electric current can be excited by muscular contraction, having been called in question by Messrs. Despretz and Becquerel, who did not succeed in obtaining favourable results on repeating the experiment, Professor Buff, of Giessen, has made a few experiments with a better result.

The galvanometer employed was constructed by Kleiner of Berlin; it had 3000 convolutions of a copper wire one-fifth of a millimetre in thickness. The extremities of this wire were connected, according to *Du Bois Reymond's directions*, with strips of platina cut out of the

same sheet of metal. Each strip dipped permanently into a vessel containing a saturated solution of common salt. Notwithstanding this precaution it was found impossible to obtain an absolute and permanent uniformity of the two strips. However, on immersing the fingers in the salt water, in general only a faint current, which soon decreased, was developed; but it was of such extent that the needle seldom came to perfect rest. By bracing the muscles of the hand and arm only doubtful effects were obtained, precisely as was found by the French experimenters. As the needle oscillated somewhat rapidly, seven to eight seconds to one oscillation, I endeavoured to render its astatic system more perfect, and succeeded in reducing the time of vibration to thirty seconds, *i. e.* in increasing the sensitiveness of the needle nearly sixteen times.

Nevertheless, the influence of the muscular contraction was scarcely rendered more perceptible. Sometimes it was more, sometimes less obscured by accidental deflections of the needle, which it becomes less possible to control the more the magnetic directive force has decreased. Very little was therefore to be expected from continuing to perfect the astatic system, at least with the multiplier in use, the wire of which did not appear to be entirely free from iron. Du Bois Reymond obtained a higher degree of sensitiveness by means of a larger number of convolutions, which is evidently preferable in experiments of this nature.*

One method of observing the phenomenon discovered by Du Bois Reymond with less sensitive instruments, is by increasing the electromotive action excited by muscular exertion. Sixteen persons took part in this experiment held each other's moistened hands on all contracting simultaneously the right, or simultaneously the arm, they formed, as it were, a circuit of increased electromotive power. The effect on the needle was now perfectly evident, opposite according as the right or left arm was contracted; the direction of the current was always from the hand to the shoulder. essential that the muscular contraction should be increased, least continued, until the needle begins to return, and then suddenly discontinued. Although it was found impossible to produce a greater deflection than 10° to 12°, the corresponding intensity of the current was sufficient to overcome any accidental influences; nay, even to stop a movement in the opposite direction, and to reverse it.—*Liebig's Annalen der Chimie* for June, 1849.—*Philosophical Magazine*, No. 236.

* Upon this investigation, Mr. Hunt remarks, in the *Athenæum*, No "Many sources of error present themselves in experiments of so delicate a nature as the above; but it does appear that we have indications of electrical disturbances which are not due to ordinary thermic or chemical action which depend upon the mechanical force employed in the muscular exerted. M. Despretz says 'the necessity for multiplying experiments evident; since we find the results of two or three experiments confirm those of M. Du Bois Reymond—and again two or three contradicting. The necessity for carefully repeating the examination is imperative far as my brief investigation has gone, I am disposed to consider the results observed by M. Despretz as due to the exhaustion of mus

CORRECTION OF MAGNETIC OBSERVATIONS.

One source of error has constantly attended Magnetic Observations in the most perfectly constructed observatories. The approach, even, of the observer has been sufficient to produce a disturbance in the magnetic bars. This error, however, no longer exists. Each magnetic bar is made to carry a little mirror, which reflects the light of a lamp upon a piece of photographic paper kept constantly moving behind an opaque plate having but one small vertical opening. On this, for every minute of the twenty-four hours, each vibration of the needle is faithfully recorded. The chemical radiations from an Argand lamp supply the observer's place; and at the same time as it records every change in the phenomenon of terrestrial magnetism it is made to mark the most delicate alternations in atmospheric pressure, and to note every increase or diminution of temperature. At Greenwich, the magnets, the barometers, and the thermometers, are all registered by actinic power: and MM. Faye and Gonjon at Paris, knowing the error of the human eye in observations on a bright object, have substituted the Daguerréotype plate for the purpose of ascertaining the actual diameter of the sun—and they propose to the observatories of Greenwich, Paris, Kœnigsberg and Pulkova, to determine by a similar method the absolute time. Electricity now determines the longitude and marks the transit of a star; and the sun's rays perform equally important offices to aid the natural philosopher in his delicate research for the truths which are as yet obscure.—*Athenæum*, No. 1117.

MAGNETIC POLARITY OF MINERALS AND ROCKS.

M. Delesse, in a memoir on this subject, states, that he finds all granites, porphyries, basalts, and greenstones magnetic; and his conclusions on the Magnetic Polarity of Crystals are curious. "When a substance is magnetic, whether homogeneous or not, aggregated or disaggregated, crystallized or non-crystallized, we can impart in all parts such pairs of poles as we will, and these poles can be inverted an indefinite number of times." This is effected by suspending the

after the first experiments have been made—as, repeatedly the deflections from 20° have fallen back slowly to 5°, and sometimes, notwithstanding violent efforts, even to zero—whereas after the arm has been rested for a few hours the original deflection has been again established. The question bears too importantly upon the entire phenomena of animal electricity to be hastily dismissed,—and it will without doubt receive a searching examination."

The experiment of M. Du Bois Reymond has been much discussed on the Continent. MM. Despretz, Becquerel, and Matteucci, have not been successful in producing the effects which were stated to have been obtained by M. Reymond, and attested by M. de Humboldt. M. de Humboldt has addressed a second letter to M. Arago, stating that at a new *séance* in the cabinet of M. Emile Du Bois Reymond the effects produced by M. Mitscherlich were most unequivocal, and fully established the truth of this new fact. "Occupied myself," concludes Humboldt, "for more than half a century in this class of physiological researches, the discovery which I have announced has for me a vital interest. *It is a phenomenon of life rendered sensible by a physical instrument.*"

body between the poles of a powerful electro-magnet; and he cludes, perhaps somewhat hastily, by stating that "the distributi the magnetic poles in a crystal is not in relation with its axes."

MINERALS FORMED BY THE HUMID WAY.

M. Senarmont has succeeded in forming several Minerals l Humid Way, which appear to throw much light on the pro employed by nature in the formation of mineral veins, and m the earthy minerals found in the granitic rocks. He encloses strong glass tube, hermetically sealed, the substances to act upo other—as, for instance, sulphate of iron and carbonate of so solution. The tube being cautiously sealed, is placed in a gun half full of water, and this being also closed, the whole arrang is exposed to the action of heat. Double decomposition of (follows the mixing of the above salts; but, under the increased sure and temperature, the carbonate of iron is re-dissolved, and tually deposited in crystals of a greyish-white character, whic not altered by exposure to the air. In a similar manner, cryst carbonate of magnesia and manganese have been formed.

TRANSFORMATIONS OF MATTER.

A bountiful Providence has thus provided the means of taining a proper equilibrium between the different kingdoms of n for even those decaying substances which are not immediately ret to the soil, but suffered to waste, are all again reanimated, onl a longer interval. It may be that the guano, which now at expense we bring in vessels from the coasts of America, is par component matter of former generations which have occupi island, to which it is now returned; dead materials, which, disc by drainage, or washed by showers into the sea, have there b converted into marine vegetation, upon which have fed the s which formed the prey of sea birds, which produce guano. A guano next assumes the shape of corn, and again is animated bodies of those by whom the corn is eaten. So, again, am rising into the air from organized substances decomposing surface of the earth, is washed down by rain, and converted by into nutritious vegetable principles. The carbonic acid disc into the air by animal respiration is the product of a constant of the living body; vegetation removes this from the air a formed, and again fixes the carbon in a solid form. Combus merely a more rapid decay, favoured by an elevated temperatu that of ordinary fuel is merely the conversion of solid carbo gaseous carbonic acid. The coal which we burn on our l becomes converted into this gas. At some bygone period before been mingled with the air in the same gaseous state become fixed by vegetation, then fossillized as coal, in which has awaited the time when it should be excavated by the b of man, once more to float through the atmosphere as a

ur, and again to go through the whole series of changes to which s been before subjected. When we consider all these things, we ot but perceive the whole economy of nature consists in one great s constantly recurring in regular and appointed order, and that labours of man, in the practice of this art of agriculture, have for object chiefly to favour and expedite some of the changes in this t series, producing results, small indeed, considered in relation to large operations of nature throughout our globe, but, for his own , capable of effecting the most beneficial consequences. And we ot but admire the sagacity and perseverance with which the an mind, in its loftier developments, is endowed, enabling it thus essfully to investigate the laws of nature's working, and to apply results of these discoveries to purposes of the highest practical ty.—*British Quarterly Review.*

PHENOMENA OF MOLECULAR CHANGE.

N the "Scientific Gossip" of the *Athenæum*, No. 1110, Feb. 3, find the following interesting note:—

It will be remembered by many of our readers that, about two s since, much curiosity was excited by the phenomenon of a liar vibratory action producing musical notes in a bar of iron ounded by a helix of copper wire, through which a current of elec-ity was passing. M. De la Rive has now proved that a molecular urbance, manifested by musical notes, is produced in non-magnetic ies by the influence of voltaic currents transmitted in a similar ner around the metal bar. He has ingeniously shown that this is in all probability, to the particular tendency of diamagnetic es to place themselves in a direction transverse to that of the smitted current. As showing the general action of the magnetic diamagnetic forces on matter, and exhibiting Phenomena of ecular Change in a very remarkable manner, these researches are e utmost value; leading us to a better understanding of many natural phenomena."

S NEW SPECIES OF ORGANIZED BEINGS APPEARED SINCE THE CREATION OF MAN?

OF. E. FORBES has read at the Royal Institution, a paper in to this important question. At intervals, during the last six , Prof. E. Forbes has brought before the members of the Royal tution various researches and inquiries illustrative of the mutual ons of the natural history sciences, and the necessity of taking gy in connexion with botany and zoology, when the causes of the omena of distribution of living beings in time and space were to nvestigated. Having last year shown how there were good ds for admitting analogous generic centres and provinces of life ne and space, he proposed in the present lecture to examine the ng *of the conclusions then* come to upon the often agitated ques-*which forms its subject.* The great increase in the list of *ls and plants known* to naturalists now as compared with the

number of species enumerated in former catalogues, cannot be admitted as offering any solution of the difficulty; for it has arisen, not through the appearance of new forms, but through the better observance of old ones. Nor are any of the asserted cases of creation of animals by electricity, &c. admitted by naturalists, since, when closely examined into, the statements have not been found trustworthy, having been founded on self-deception and insufficient knowledge on the part of the observers.

Sir C. Lyell has suggested that, by combining geological with zoological inquiries, light might be thrown upon the relative dates of creation of man and inferior beings. The argument now adduced by the lecturer, he believes for the first time, is of such a nature. It is this:—Regarding the human epoch as commencing at the termination of what are usually styled geological periods, we should date the creation of man at no long interval in geological time after the close of the glacial epoch. Since that date, certain geological areas, both of land and water, have been formed, presenting such physical conditions as would entitle us to expect to find within their bounds one, or in some instances more than one, centre of creation, or point of maximum of a zoological or botanical province.

But a critical examination of the population of such post-Adamite areas shows that, instead of exhibiting distinct *foci* of creation, they have been in all instances peopled by colonization—*i. e.*, by migration of species of animals from pre-existing and in every case pre-Adamite provinces. Among terrestrial areas, the British Isles may serve as an example; among marine, the Baltic, Mediterranean, and Black Seas. The British Islands have been colonized from various centres of creation in (now) continental Europe; the Baltic Sea from the sea of the Celtic region, although it runs itself into the conditions of the boreal province; the Mediterranean as it now appears from the Fauna and Flora of the more ancient Lusitanian province. Supporting the same view, a map was exhibited showing the relation the centres of creation of pulmoniferous mollusks in Europe bore to the geological history of the area, and proving that the whole snail population of its northern and central extent, that great portion of it of newest and probably post-Adamite origin, has been derived from *foci* of creation seated in pre-Adamite lands. These remarkable facts induce the lecturer to maintain the improbability of post-Adamite creations.

This view of the answer is supported by a more abstract and theoretical line of argument founded on the relation of man with centres of creation in time. If the Faunas and Floras colonizing the new or post-Adamite areas were of simultaneous origin with man, then the analogy of provinces, in time, would lead us to expect new creations after his advent. For in such a case the point or centre of creative intensity might, and most probably would, be subsequent to man's creation. But a critical examination of such portions of the assemblages of plants and animals peopling the new areas as can most be *depended on* for throwing light on their history in time, induces us to *regard them*, not as portions of post-Adamite, but as members of

admitted pre-Adamite, centres. This consideration inclines us to believe that the last province in time was completed before the coming of man, and to maintain an hypothesis *that man stands unique in space and time, in himself equal to the sum of any pre-existing centre of creation, or of all;* an hypothesis consistent with man's moral and social position in the world.—*Athenæum*, No. 1117.

GIPSIES.

LETTERS from Captain Newbold have been read to the Asiatic Society, descriptive of the manners and habits of the Gipsies of Syria, Egypt, and Persia. This mysterious race is found scattered in various tribes over Syria, Palestine, Asia Minor, and Egypt; although, according to Leo Clavius, the Emperor Bajazet expelled them all from the Ottoman Empire. In Palestine and the south of Syria they are designated *Náuer;* but in the north of Syria and Asia Minor they style themselves *Kurbát, Rumeli*, or *Jingánih.* In all these countries the gipsies present the peculiarities of their brethren in Europe; leading a wandering life, and subsisting chiefly on the credulity of the people around them. The men are dealers in donkeys, horses, and cattle; and are adepts in snaring game. The women are fortune-tellers and venders of charms; and they pretend to great knowledge in palmistry, divination, and the art of making philtres. They are not believed to have any idea of religion; nor are they known ever to pray or perform any religious rite. But in the East, many have, from compulsion, learnt, and will, if pressed, repeat, the Mohammedan creed. They are said to eat the flesh of all animals but the hog. In physical appearance they resemble the gipsies of Europe, particularly in the peculiar expression of the eye. When living near towns, they dress much like other people; but when in the hills, or in secluded places, they go half naked, dwelling in tents or moveable huts. From information obtained from the head of the gipsies at Aleppo, it is understood that his tribe is divided into thirty *baits*, or houses; and he is responsible for their conduct, and for their tribute to the Turkish Government. He believes that his race has lived in those parts since the creation; although he has heard a tradition of their having come from Hind, or India. In their intercourse with the people around, they speak Turkish or Arabic; but among themselves they converse in their own peculiar dialect—of which Captain Newbold collected, *viva voce*, a number of words. Many of these are Sanscrit, mixed with Persian, Turkish, and Arabic. The numerals are partly Hindú, partly Persian, but are defective, and their defects are made up from the Turkish dialect. The grammatical inflexions in some points resemble the Hindustani. Certain chiefs asserted that their people had a peculiar written character, a symbol; but if this be true it is known to very few, and kept secret. In Egypt they are called *Helebis;* and, as in other lands, they form a distinct class of people, living apart, and differing in language, from the other inhabitants, being *aliens in the land which the* English long believed to be that of their

origin. Their mode of life is much the same in Syria and in Europe the men being dealers in animals, the women fortune-tellers an makers of charms, &c. They move from place to place, but seldom wander far from the valley and delta of the Nile. Their physical peculiarities are clearly discernible; although in dress they differ little from the other people. Their aptitude in disguise, however, enable them to deceive many; and concealed gipsies are said to be found i every public department in Egypt. The *Helebis* are a different rac from the *Ghajars*, another class of vagrants, who are rope-dancer musicians, and the like; but there is some connexion between them for a *Helebi* will marry a *Ghajar* maiden, although he will not give damsel of his own to a *Ghajar*. The women, unlike those of th *Ghajars*, are very chaste. They are punished with death if detecte in an intrigue.

Their language differs from that of the Kurbáts of Syria. Only few words are the same; and there is in it a greater proportion Arabic, and less of Persian, Turkish, or Indian. Their numerals a defective, and are principally Persian. No peculiar written charact has hitherto been found among them. They pretend to draw the origin from Yemen, or the Hadramat; from whence they say th were driven out by a tyrannical king named Zir, and that their histo is written in an obscure work called the "Tarikh i Zir," of which copy has yet been obtained. They are now compelled to pay a hi of poll-tax, which they attempt to evade by every possible means— that it is difficult to compute their number; but there is no dou that it was much underrated by the principal Sheikh, who stated t there were in Egypt four houses, each consisting of about fifty famili They do not acknowledge any religion of their own; but they have scruple in externally conforming to Mohammedan opinions observances.

The gipsies of Persia may be traced over all the country from Caspian to the deserts of Kerman and Mekran. They are found in Scinde, Beloochistan, and Mooltan. Their kind of life is essent the same as that of their brethren in Syria and Egypt. In P they are divided into two great divisions—the *Kaoli* or *Gha* (identified with the Kurbáts of Syria), and the *Goubaz*. The o of these terms is doubtful; but the first appears to be a corrupti *Kábule*, belonging to Kabul.

There are other classes of vagabonds pretending to be gipsie who are not so. The gipsies rarely intermarry with the surrou people; and they conform to the Mohammedan faith when advantageous for them to do so. The few of their words which been obtained are nearly identical with the Hindustani and the Egyptian equivalents. A comparison of the vocabularies wi extensive list collected in England by Col. Harriott, and publis the second volume of the Society's Transactions, is a convincing of the identity of all those scattered tribes of one great race.

PROPER BALANCE OF FOOD IN NUTRITION.

DR. C. REMIGIUS FRESENIUS has published the results of his experiments in illustration of the "practical application of the law pointed out by Dr. R. Thomson, of the Proper Balance of Food in Nutrition." We have only space to quote the learned Professor's conclusions:—

We have approximated much more closely to the object we had in view—viz. a completely rational system of nutrition—than it has hitherto been possible to do, and can answer the proposed questions with perfectly accurate average numbers; and we have now only duly to consider the influence which the unappropriated portions of food exert on the body (the getting rid of them involves a waste of strength); and further, the greater or less degree of digestibility of each species of aliment, in order to do it with perfect precision.

But we can even now, from what has already been stated, educe safe and weighty conclusions—namely, the following:—

1. It is an impossibility to sustain either a man or a beast on food entirely devoid of nitrogen, however great in quantity it may be.

2. All that has been said in the older as well as in many of the newer books on husbandry, respecting the relative nutritive value of different kinds of forage, cannot—inasmuch as it was not arrived at by experience, but deduced from theoretical views—possibly be correct, because these views do not accord with facts.

3. The discovery of the true relative value of aliment, and of the proportion in which it may be replaced, may be ascertained without much difficulty, so long as chemists and farmers work hand in hand for the exact solution of the above questions.

4. A completely rational system of nutrition, that is, such an one as combines the greatest amount of strength with the least consumption of nourishment, will then be possible.

5. A loss of nutritious matter, and of strength, often takes place where it would be least expected—namely, by the consumption of all kinds of food (or forage) where the due proportion between nitrogenous and non-nitrogenous constituents does not exist—say by eating only fruit or potatoes.

6. It can with safety be decided by the above under what circumstances substitutes for bread may be employed, and what is their respective value for each desired proportion.

The following is the scientific rationale *of Cookery.*

Many kinds of food cannot be eaten raw by man; others, although they may be eaten raw, agree much better with us when cooked.

Hence boiling, roasting, baking, &c., has a twofold effect; primarily, it converts indigestible or food difficult of digestion into a digestible or more easily digestible condition. Thus, starch is converted into gelatinous starch, into dextrine or sugar; cartilaginous substances into glue; and chondrine, fibrine, into changed fibrine, &c. Secondly, it frequently confers upon them an agreeable taste.

But *can the real nutritive* value of food be augmented by cooking?

Impossible! Still it may be of the greatest benefit in feeding cal to cook their food. The advantage accrues in this way: that potato turnips, &c., are more quickly and more easily digested when bo than raw; and thus there is much less chance for any portion to thrown off in an undigested state (unassimilated). Its warmth gives a slight advantage to cooked food; it deprives the body of no he and the non-nitrogenous substances, which in the cold food we have been required to afford heat, can be used for the productio fat. But whether cold or warm food is to be preferred in a pract point of view, cannot from all this be conclusively deduced. It question only to be answered by experience, for the result is enti dependent on the nature and requirements of the animal.—*Transl from the German, in the Philosophical Magazine*, No. 234.

SOUND.

THE Astronomer-Royal, in a communication to the *Philosop Magazine*, No. 231, observes: on the probable sensational indic of the physical phenomenon, "interruption of continuity of par of air," it is my belief that it produces that Sound, which, acco as it is in a high key, or is in a low key, or is articulately interru is called a hiss, a buzz, or a whispher, and of which the phonetic sy is S or Z. Perhaps also, the sound which we call a roar, of whi symbol is R, is related to it; for philologists appear to take for gr that these letters represent cognate sounds: thus Niebuhr assu indubitable that Aurunci and Ausonii are the same word. M sons for connecting the sound of S with the interruption of conti or with the broken character of the aërial wave, are the followin

"1. It has long ago been remarked that the sound of S is turned by an ordinary echo. In like manner, a broken-headed not reflected by a vertical pier. When a broken-headed sea st pier perpendicularly, it is thrown upwards; when it strikes liquely, it is partly thrown upwards, and partly it runs horiz along the face of the pier. In neither case is there any refle the broken head, or any creation of a broken wave travelling opposite direction, although the swell is reflected according usually understood laws.

"2. It is well known that in whispering galleries the sour whisper is carried along the surface of the dome, and never qui surface, and can be heard on the opposite side only by applyi ear very near to that surface; while an ordinary sound is not mitted along the surface, and is not heard at the opposite side dome in any striking intensity. In like manner, a broken-hea will run along the face of a vertical pier for a considerable d without showing any disposition to quit it; while an ordinary fl tion is thrown off at once, in the form of a swell rolling away angle given by the usual laws of reflexion.

"Whether there is any well-established instance of the con of a clear musical sound into a hiss or buzz, by mere distance mission, I am not able to say; but I should think that, lo

he wave could have received its change of character to the degree necessary to produce discontinuity of particles—even supposing that is co-efficient had remained undiminished—that co-efficient would, rom friction or from expansion of the wave, have become so small, hat there would be no perceptible tendency in the wave to change its orm. So far, however, as the tendency to change the form exists, it will be greater for loud sounds than for faint sounds, and greater for ounds in a high key than for sounds in a low key; or, in other words, he sounds which might be expected soonest to degenerate into hiss or buzz, would be loud sounds on a high key."

VOICE IN MAN.

Dr. Pettigrew has read at the Royal Institution, a paper "On he Mechanism and Functions of the Organs of Voice in Man;" with the introduction of a case of double utterance. After a few prefatory observations upon the pleasure derived from the study of anatomy, more especially when assisted by the abours of the scientific chemist, the natural philosopher, and mechanician,—the lecturer entered upon the subject above mentioned; first describing the situation in the larynx, and its contiguous parts. Its skeleton was made up of a number of parts; the material chosen for which was gristle, the best vibratory substance found in the frame, —other parts, as the ear, in connexion with sound, being formed of a similar fabric. It consisted of many parts, as it was to be elongated, shortened, widened, or narrowed. The gristles were to be held together; this was effected by bands of an inelastic nature, by which means displacement was prevented; the parts were acted upon by groups of muscles (the moving powers of the body); the muscles (as waste took place upon any movement) were well supplied by arterial or nourishing blood, the refuse being returned by the veins into the circulating system again to undergo purification in the lungs. The muscles were put into action by the nerves; these emanating from the brain and upper part of the spinal marrow, and thus under the control of the will. The connexion of these nerves with those of respiration, the heart, lungs, and stomach, were described; and an especial ganglion (dissections of which from various animals presented by the late Sir Astley Cooper to the lecturer were exhibited) giving exquisite sensations to the opening to the larynx as an entrance to the lungs was, from its great importance, particularly dwelt upon. A set of vessels, called absorbents, removed the effete materials of the organ. Internally, the larynx presented a smooth membrane, having the power of secreting a fluid of a glairy nature for the purpose of preventing injury to the more delicate parts from the passage of the air to the lung cells. At the upper part of the larynx, beneath the mucous membrane, four vocal cords were described, two upon each side; these bounded the cavity of the ventricles leading to the sacculi of the larynx. Upon the action of the vocal bands depended the pitch of voice. All *sounds* emanating from the larynx were simple, *the larynx being with regard* to the voice what the reed is to the haut-

boy or clarionet. Many experiments were shown to prove that the primitive sound was produced by the vocal bands forming the edge of the glottis; and the peculiar baa-ing of the lamb was produced by an apparatus attached to the larynx and windpipe of a dead lamb.

Other points in connexion with the subject were illustrated by numerous specimens upon the table, and a new instrument kindly lent for the occasion by Prof. Wheatstone. The damper in this instrument was particularly described as illustrating the action of certain muscles in the human body upon the thyroid glands; thus preventing the continued vibration of one sound into another,—Sir Charles Bell's theory being revived by the lecturer, and supported by allusions to comparative anatomy. Attention was drawn to intensity of voice, capacity, and also the tones in the male, female, and boy. Articulation and speech were described as modifications of voice, and produced by the action of the pharynx, the nasal cavities, the tongue, and muscles about the cheeks and lips. A child before it had cut its teeth could only utter labial words, such as papa, mama, baby; or daddy instead of father, the tongue being then pressed against the palate.

Dr. Pettigrew then alluded to the manner in which ventriloquism was performed; which was illustrated by Mr. Brook, who imitated a man in the chimney ascending and descending. Mr. Richmond was then introduced, who performed two airs, each as a duet, synchronously. After a very careful examination, assisted by Dr. Macdonald, Prof. Bowman, and M. Garsin, the lecturer had arrived at the conclusion that the two tones were thus accomplished: the voice was of course simple, and produced in the larynx; the current of vibration was split, as proved by the flame of a candle,—the bass notes being modified in the upper part of the pharynx and nasal passages, the treble being produced by the tongue forming with the arched roof of the palate a tube, open by a very small aperture in front, the tube being altered in length by the nicest adjustment of its muscles; these latter acting more perfectly from the fixature to the os hyoides and the roof of the mouth.

MULTIPLE SOUNDS OF BODIES.

M. Duhamel has contributed to the *Annales de Chimie et de Physique*, an elaborate memoir on this subject, which will be found entire in the *Philosophical Magazine*, No. 231. We have only room for the author's summing up, in which he says that he has established theoretically and experimentally the following:—

The phænomena of simultaneous perception of several sounds proceeding from the movement, whether of several points or of a single one, are only modifications of one general phænomenon, which may be stated as follows:—

"When our organ of hearing is affected by a movement that may be geometrically decomposed into several others, which, if they existed separately, would yield different sounds, we generally perceive these sounds at the same time."

Electrical Science.

ARIATIONS OF THE MAGNETIC NEEDLE AND THE AURORA BOREALIS.

sophical Magazine, No. 229, appears an extract from . A. de la Rive to M. Arago, in which the author at- iurnal Variations of the Magnetic Needle, and the , to the effect of electric currents at the surface of the : atmosphere.

ity with the laws established by Ampère," says M. de :urrent which proceeds from the northern pole to the to cause the north pole of the needle to deviate to the that takes place in our hemisphere; and the current from the southern pole to the equator should cause f the needle to deviate to the east, which is precisely :he southern hemisphere. The deviation should be, in e place, the more considerable the greater the differ- ture; and consequently, of the electric conditions be- and the upper stratum of the atmosphere: thus, the ses from the morning to 1h. 30m. P.M. It is more those months during which the sun is longer above is at its minimum in the winter months. Lastly, riations increase in magnitude in proportion as we equator and approach the pole; a result which again with what I have stated respecting the increase in urrents towards the polar regions. In these regions ariations may be very irregular, and may be entirely agnetic needle happens to be placed in those very :he electric currents traverse the atmosphere to reach :t, a needle surrounded thus on all sides by currents ected by them, or at least is no longer affected in a "

adds that he has only noticed the causes disturbing the magnetic needle, and not of the cause of this that is to say, of terrestrial magnetism, a cause which not believe to be of the same nature, but upon which s no opinion; he being rather content to consider the as a large spherical magnet, and to study the external modifying the direction which it tends to impart in gnet to magnetic needles.

M. de la Rive's theory, the aurora borealis is the f electric currents travelling in the high region of the rds the north pole, an effect due to the combination tions, which are not always exhibited in the same ll seasons of the year.

proved that the aurora borealis is an atmospheric *ong since suspected* by M. Arago. The name of *by which* Von Humboldt designates it in his Cos-

mos, implies the same idea ; and this is moreover confirm
teresting details which he gives of the meteor. The ol
Parry, Franklin, and especially those of MM. Bravais a
numerous and carefully made, are likewise quite favo
opinion, which followed equally from the observations (
the Shetland Isles.

Admitting this point, M. de la Rive explains the pro
aurora borealis in the following manner :—" When tl
passed into the southern hemisphere, no longer heats
hemisphere, the aqueous vapours which have accum
the summer in this part of the atmosphere begin to
kind of humid cap enveloping the polar regions exte
more, and facilitates the passage of the electricity accu
upper portions of the air. But in these elevated regi
cially at this period of the year, the aqueous vapours n
quently pass into the state of minute particles of ice o
in the air, similar to those which give rise to the halos ;
it were, a kind of semitransparent mist. Now these h
conduct the electricity to the surface of the earth near
are at the same time illumined by these currents or
charges. In fact, all observers agree in asserting tl
borealis is constantly preceded by a mist which rises f
and the margins of which, less dense than the remainde
the first ; and indeed it is very frequent near the pol
months, and especially in those where there is abunda
in the air. For it to be visible at great distances from
necessary that these clouds, composed of frozen parti
an almost uninterrupted manner from the polar region
southern latitudes, which must be of rare occurrence.
clouds, when they are partial, which is frequently the
the halos."

The magnetic disturbances which always accompar
ance of an aurora borealis are then referred to the ac
of a greater proportion of the accumulated electricitie
normal action of the regular current, according to the
current acting upon the needle, and consequently on
impossible to foresee, since they depend on the extent
menon and the position of the needle in relation to it.
zontal plane in which the declination needle moves, com
below, some of the region in which the greatest activity
menon takes place, it will be either the current circ
earth or that travelling in the air (currents which proc
trary direction) which will act upon the needle ; ev
same aurora, it may be sometimes one, sometimes the
two. The variable directions in which the needle is d
an aurora borealis agree very well with this explanat
judge from the different observations published in
Chimie et de Physique, and in several scientific v
markable effect observed by M. Matteucci in the

ic telegraph between Ravenna and Pisa, during the magnificent a of the 17th of November, 1848, fully proves the existence of a nt circulating on the surface of the earth; and which, ascending ire of the telegraph, passed in part through this better conr. The sounds which long iron wires strung in the direction of to south give out under certain meteorological circumstances, ndoubtedly a proof that they are traversed by a current which bably derived from the currents circulating on the surface of the from north to south in our hemisphere.

de la Rive then suggests that "it would be highly interesting mportant to profit by those telegraph wires, which are found to a direction more or less approaching to that of the declination e, in order to make with them, when they are not in use for ary purposes, some observations which would enable us to detrate and to measure the electric currents which probably trathem."

the early part of 1847, Mr. W. H. Barlow was led to undertake sive observations on this subject, in consequence of the peculiar rbances occasionally visible on the telegraph instruments of the nd Railway, on which line the telegraph was erected under Mr. w's superintendence, as the company's engineer.

ese disturbances were at first attributed to atmospheric electricity g to the earth by means of the wires; but from certain effects ved, Mr. Barlow was led to infer that they were due to other s.

. Barlow's experiments are detailed in the *Philosophical Maga-* No. 230, May, 1849; but they were first recorded in a paper read Royal Society, in June, 1847. Having obtained delicate galvaters, he first ascertained that currents are at all times perceptible e telegraph wires to a greater or less extent when the galvano- is applied on a sufficient length of wire, and between two earth ctions; but that wires having no earth connection, or only one, ited no currents. Mr. Barlow also found by simultaneous obsers on two galvanometers, applied one at each extremity of a forty-one miles long, that the changes of force and direction of urrents were simultaneous at both ends; the current passing from one earth connection to the other.

t the most interesting fact which appeared during these observa- and that which bears immediately on the remarks contained in etter of M. de la Rive, is that there is a daily movement of the nometer needle, similar to that of the horizontal magnetic needle, ced by the electric currents travelling in one direction from 8 A.M. to 8 P.M., and returning in the opposite direction during emainder of the twenty-four hours. The times of zero are not rly maintained, and vary from 7 to 10 o'clock both in the mornnd evening; but the greatest regularity is observable in the ng, and the mean result of numerous observations is as above

regular diurnal movement of the galvanometer needle is sub-

ject to disturbances of greater or less force and duration, which found to be of greatest energy during magnetic storms, and when aurora is visible; and in these cases the currents are so strong as affect the ordinary telegraph instruments, and sometimes prevent al gether the transmission of messages.

The next experiments were made with a view to ascertain the direction in which these currents alternate; and the result, as determin from numerous observations, denotes it to be from north-east south-west. Mr. Barlow concludes by stating that his idea of origin of the currents differs in one respect from the theory of M. la Rive; inasmuch as he considers them to arise in the atmosph whereas Mr. Barlow has attributed them to thermo-electric action the crust of the earth. The author speaks with great deference on subject of this kind; but there is an important fact tending to conclusion which is now well ascertained, namely, that in the tel graphs which are laid entirely under ground, deflections occur sim to those before described; while wires suspended in the air exhibit deflections, unless they are connected with the earth in two places and then the direction in which the current travels depends on relative position of the earth connections, however circuitous may the route of the wire itself.

Lieut.-Colonel Sabine has read to the Royal Society a paper of re marks on M. de la Rive's theory, for which see *Athenæum*, No. 11

M. Baumgartner has also been inquiring into this subject; his in vestigations having been principally directed to the line of wires fr Vienna and Gratz to Senmering. He proves that the needle ra returns to its true zero:—it is always subject to more or less deviati from the atmospheric current. The deviations are of two kinds—o producing a deflection of often 50°, the other varying from hal degree to 8°. The first are much less frequent; and they vary direction and intensity in such a way that the law by which they guided cannot be yet detected. The other, on the contrary, ap to obey a simple law. During the day it is from Vienna to th tions to the south of that city, and during the night in a contr rection. The change in the direction appears to be accom after the rising and after the setting of the sun. When the ai and the sky serene, the regularity of the current is very decide not so uniform in cold and wet weather. M. de la Rive al observed facts which completely accord with those of M. Baumg

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DIA-MAGNETISM.

Mr. W. S. Ward has communicated to the British Associati two following papers upon Dia-magnetic Phenomena.

The first treats of "Motions exhibited by Metals under the Inf of Magnetic and Dia-magnetic Forces." "In the course of a se *experiments* in relation to dia-magnetism, I observed," says Mr. W "*that* the nature of the action upon many metals varied wi *intensity* of the magnetic force, and I found that such effects *accordance* with the observations of Professor Plücher, '

dia-magnetic force increases more rapidly than the magnetic in relation to the power of the exciting magnet.' I took considerable care in procuring specimens of pure silver, copper, lead, tin, and zinc, and found that these assumed the magnetic or dia-magnetic state according to the power of the magnet employed. I found a magnet of very moderate size and power sufficient, if the polar pieces were brought near to each other, and the metals the subject of experiment were in small discs and delicately suspended. My attention being particularly directed to the phenomena which Mr. Faraday terms revulsion, I observed that the direction of the revulsive motions changed when the magnetic or dia-magnetic state of the metal was changed. When the polar pieces were adjusted within one quarter of an inch apart, and the disc of metal so suspended that one-half was without and the other half between the polar pieces, another series of phenomena presented themselves. On developing the magnetic force the disc moves as a pendulum with a tendency to pass outwards from between the polar pieces; on breaking contact the disc moved in the reverse direction, tending to pass within the polar pieces. Such motions are remarkable in that the direction of them is alike in all metals. Such motions appear to result from electrical currents rather than from magnetic or dia-magnetic forces, for on substituting for the disc of metal a flat spiral of insulated wire they were not produced, but on using a similar spiral, but of which the ends of wire were in good contact, the like phenomena were observed as with a disc.

Mr. Ward's second communication illustrates "A Theory of induced Electric Currents suggested by Dia-magnetic Phenomena."—The phenomena mentioned in the foregoing paper involve many points which cannot be easily accounted for according to the received theories of magnetism. Ampère's theory may account for magnetic or dia-magnetic phenomena taken separately, but not easily for the changes of condition which take place in the same metal, still less for the changes in the direction of the revulsive motions, particularly those which follow the sluggish condition of the metal under the influence of that amount of force by which the magnetism or dia-magnetism are nearly balanced. It also appears that the induced or secondary electric current may be accounted for on the hypothesis that the current in the primary conductor effects a molecular disturbance in the parallel or secondary force (such disturbance being in the nature of a magnetic affection), and that such disturbance correlatively induces the secondary current both when it is produced and when it ceases. This hypothesis is also in accordance with the fact, that this induced current is only transient, and also appears the best explanation why the induced is not of equal duration with the inducing current.

The phenomena of dia-magnetism, pointing as they do to some of those physical conditions by which the arrangement of the particles of matter is determined, have excited a large share of attention. M. Reich, of *Freyberg, is disposed* to regard the phenomena as instances *of the repulsive action of* the poles of a magnet upon all bodies which

are not themselves magnetic. Professor Plücker, in a letter to Faraday, states that "the *Cyanite* if suspended horizontally poi very well to the north, *by the magnetic power of the earth only.* is a true compass-needle; and, more than that, you may obtain declination." "The cyrstal does not point according to the ma netism of its substance, *but only in obedience to the magnetic act upon its optical axes.* This is in full accordance with the differ law of diminution by distance of the puremagnetic and the optom netic action."—Again, M. Edmond Becquerel has published a mem in which he supports the three following conclusions:—1. All bod are as magnetic as soft iron itself when under the influence of a ma net, but to a degree more or less marked according to their natu 2. The momentary magnetization of a body depends not upon t mass, but upon the manner in which the ether is divided in the bod 3. A substance is drawn by a magnetic centre with the difference action exerted upon this substance and upon the volume of the di placed medium. It will be seen by this that the young French philo sopher does not admit a distinction between dia-magnetism and mag netism properly so called. A more careful examination of the labou of Faraday and Plücker would, we think, have led M. Edmond Bec querel to other conclusions. At present, he founds his views upo the fact that charcoal deprived of the air which it condenses within i pores is in a different state magnetically from the same substan when it contains either atmospheric air or oxygen gas.—*Athenæu* No 1132.

Mr. Faraday's discovery of dia-magnetic phenomena is likely t lead rapidly to some important knowledge of the molecular forc which determine the conditions of the material creation. Plücker Bonn, in a letter to a friend, says:—I replace the declination ne by certain crystals suspended horizontally by a fibre of cocoon They take under the action of the earth's magnetism a determ and fixed direction. I can vary at will and predict this with tainty; and obtain crystals to act as needles which shall poin stantly towards the poles of the earth—towards the magnetic po or towards some azimuthal point."—(See *Year-book of Facts,* page 148.)

Professor Œrsted, the well-known discoverer of electro-magne has recently been engaged in a close investigation of the laws w regulate dia-magnetic phenomena; and in connection with these searches he has noted some results which bear strongly on the ques of the employment of electro-magnetism as a motive power. Professor finds that if a magnetic power equal to 100 is produced one pair of galvanic elements, 144 only is produced by two pair that no sensible increase of power is produced by three pairs of si lar plates—and that eight or sixteen pairs only give a power at equal to twice the effect of a single pair. When the armature $\frac{1}{400}$ of an inch from the electro-magnet, the power was 0.178 of produced by contact; but sixteen elements then produced four the effect of a single pair. It appears to us that these results

the impracticability of employing electricity as a motive power within the limits of any ordinary economy.—*Athenæum*, No. 1110.

COST OF VOLTAIC POWER.

Mr. W. S. WARD has illustrated to the British Association, "The comparative Cost of making various Voltaic Arrangements." The author stated that a series of calculations founded on data produced to the Chemical Section at Swansea, in 1848, showed the efficient power of three generally used forms of battery known as Smee's, Daniell's, and Grove's, would be equal when 100 pairs of Smee's, 55 pairs of Daniell's or 34 pairs of Grove's were used, and that the expense of working such batteries as regards a standard of 60 grains of zinc in each cell per hour, would be about 6d., 7½d. and 8d. respectively.

ELECTRO-BIOLOGY.

MR. ALFRED SMEE, F.R.S., has illustrated to the London Institution, his discoveries connected with the Voltaic Mechanism of Man, upon which he has also published a treatise.*

For animal life it is necessary to have a central portion or brain, a peripheral, or body, both supplied with bright arterial blood, and connected together by nerve fibres. Mr. Smee traced the analogy between this arrangement and that of a double voltaic circuit, and demonstrated that the communicating portion might be fluid, or in other words, that tubes filled with fluid would serve as well for electric telegraphs as ordinary wires, and that the nerves perform a similar office in the body. He explained that there were great difficulties in the way of ascertaining the presence of a voltaic current in any fluid, but that he had succeeded in overcoming that difficulty by the use of what he termed the electro-voltaic test, which was exhibited to the audience. In imitation of the action of light upon the eye, the lecturer stated that he had constructed numerous voltaic currents in which the current was solely determined by the action of the sun's rays. In imitation of the other organs of sensation, Mr. Smee exhibited a contrivance in which the voltaic circuit was caused by odours; in another contrivance a similar current was produced by savours; in others the current was set in motion by heat or force. The effect in each case, notwithstanding the delicacy of the experiments, was extremely well marked, and elicited much applause. Mr. Smee exhibited voltaic combinations in imitation of the commissures of the brain, and of the theoretical structure of that organ, which, he stated, is sufficient to account for all mental phenomena. The artificial electric eel deflected the galvanometer more powerfully, to the great delight of the audience, and the artificial muscular substance moved a long level over the space of three or four feet. The functions of the blood corpuscle were strikingly illustrated by an analogical experiment made with an artifi-

* Elements of Electro-Biology, or the Voltaic Mechanism of Man; of Electro-Pathology, *especially of the* Nervous System; and of Electro-Therapeutics. *By Alfred Smee, F.R.S.* Longman & Co.

cial corpuscle made of menhare and per-nitrate of iron. The inje tions of brain exhibited under the microscope in the library were surpassing beauty, and well illustrated "How fearfully and wond fully we are made." The lecturer summed up by showing that se sations, mind, thought, and all functions of animal life, were entir due to voltaic action, and obedient to physical laws; neverthele that science no less leads us to infer than religion commands us to l lieve, that man is immortal, though that which is mortal should no be confounded with that which gives to man his immortality.

M. Strauss-Durckheim has presented a memoir to the Academy Sciences, at Paris, "On the Analogy between the Muscular Fibre the Voltaic Pile," the nervous influence being regarded by him bearing a remarkable resemblance in all its phenomena to the vol current. This curious but involved subject appears, at length, likel be brought under the careful examination of competent investigat

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ELECTRICITY OF THE ATMOSPHERE.

A PAPER has been communicated to the British Association, " Professor's Quetelet's Investigations relating to the Electricity of Atmosphere, made with Peltier's Electrometer," by Professor Whe stone. Of all the meteorological conditions of the atmosphere, electrical state is perhaps among the most important. Yet in t various observations established in different parts of the world in co nexion with the great magnetic inquiry now in progress, and in t establishment of which the British Association has taken so promine a part, no provision has been made for regular observations relati to this important subject. Thus, while we possess a most valual accumulation of periodical records—made with great accuracy regularity at widely different points of the earth's surface—relatin the magnetism of the earth, and to the barometric, thermome hygrometric, and anemometric conditions of the atmosphere, we no simultaneous electrical observations with which to compare This has arisen from the want of a simple and efficient instrum which such observations could be made. The most valuable which have hitherto been obtained have been made with fixed apparatus. That established at the Observatory of the Britis ciation at Kew, under the superintendence of Mr. Ronalds, which he has introduced so many important improvements, wh der it, in perfectness of insulation and the comparability of tached electrometers, superior to any hitherto erected, will no when the observations made at the establishment during the p years are reduced and discussed, as is now being done by Mr yield valuable results. Still such apparatus are too costly, a quire too many precautions in their establishment and manip to be recommended for general use. Meteorologists will lear satisfaction that this deficiency is now supplied by the late M. P induction electrometer—a portable instrument, simple in its con tion, certain in its results, and of which any number may b perfectly comparable with each other.—*Athenæum*, No. 1141

M. Quetelet has published in the *Bulletin* of the Royal Academy of Sciences of Belgium, the results of his observations on the electricity of the air during the first nine months of the year 1849,—in which he has tabulated the maximum and minimum electrical intensity for each month. From this paper we extract the mean electrical intensity of the air for the years from 1844 to 1848, both inclusive, and the means of the same months in the present year. The differences will be seen to be very remarkable; and, as connecting themselves with the public health, important.

	Means of 1844-1848.	Means of 1849.
January	53 deg.	39 deg.
February	47	36
March	38	27
April	27	20
May	21	16
June	18	13
July	19	14
August	21	21
September	24	24

ON TREES CLEFT BY THE DIRECT ACTION OF ELECTRICAL STORMS.
BY CH. MARTINS.

The passage of Electrical Storms over the wooded parts of the country is marked by varied effects on the trees which cover it. A great number of them are merely torn up and thrown on the earth, others are uprooted and transported parallel to themselves to great distances. A great number have the heads broken off, and the country is strewed with branches and twigs broken and scattered to a distance. All these effects are well explained by the action of the violent wind which drives the clouds charged with the electricity constituting the electric storm. It is not the same with the *cleft* trees of which we are about to speak. The action of the wind cannot explain the appearances which they present. At leaving the ground, or more frequently from 2 to 0m·50 from the ground, and for a length varying from 2 to 5 metres, these trees are divided into laths, in shreds or splinters, often as small as matches. This may be seen in numerous trunks which were cut in the neighbourhood of Montville and Malaunay after the celebrated storm of the 19th August, 1845. This cleavage never extends to the whole of the tree, but only the half or three-quarters of its thickness. The cleft part is turned sometimes to the side from which the meteor came, at other times to the opposite side. The tree is broken in the middle of the length of the cleavage, and the top is not carried off as in the decapitated trees.

A still more essential character is, that these laths and splinters are completely dried immediately after the passage of the meteor. M. Preisser assured himself of this at Montville; MM. Decaisne and Bouchard in the trunks struck by the storm at Chatenay; M. de Gasparin in the poplars broken by the storm of Courthezon. The dryness of these splinters renders them extremely fragile. M. d'Arcet found only 7 parts in 100 of water in the cleft trunks of Chatenay. Now, *standing trees contain from* 30 to 40 parts in the 100; and

such as have been felled for five years still contain fr
25 parts in 100. The bark of the cleft trees is split, tc
upon itself, and cut into shreds, adhering to the tree or
around it.

A fact related by M. Boussingault perfectly explains thi
tion of the sap under the influence of electricity. On the
1842, the lightning fell upon a large pear-tree, at Bech
Alsace; a thick column of vapour, like the smoke which i
a forge fed by coals, arose, and splinters of wood were t
distance of many metres; the bark had disappeared; th
peared entirely white. M. Boussingault does not doubt
the vapour of water which made this tree fly in pieces. M.
entirely of this opinion. It appears to him that cleft tr
compared to boilers burst by the expansion of steam.

In cleft trees the sap mostly evaporates, the trunk is
thousand pieces, and the wind acts on the cleft portion,
dently offers less resistance than the rest of the trunk.
rated sap resembles thick smoke: hence the mistake of th
at Montville, who all supposed that a fire had broken
forests over which the storm passed.

The deep colour of the evaporated sap was, probably, o
earthy particles which the wind and the electrical attrac
into the air. Lastly, to finish the demonstration, MM.
father and son, have succeeded in reproducing, by mean
electrical discharges, cleavage of trees, in branches of the
little finger.

The cleft trees produced by the direct action of the ele
mark out to us its line of passage above the ground; they
cupy the centre of the ravaged zone. On the plateau of M
total breadth was 220 metres; in the centre they occupie
89 metres.

The cleavage presents different characters in different t
in oaks that it is most perfect; the tree is divided in l
towards the interior, are often not larger than small flexibl
or than common matches. The direction of the cleavage
responds to that of the medullary rays; the tree being
broken across towards the middle of the length of the c
baguettes which can be detached are in general whole the l
entire length. M. Martins separated two from the upper l
of an oak, which are, the one $2^{m}\cdot50$ the other $2^{m}\cdot27$ in le
first measured eight, the second nine millimetres on the si

In beech-trees, the cleavage is coarser than in oaks; we
serve matches; they are laths always two or three centim
but often very long. It was in a large beech $0^{m}\cdot38$ diameter
that M. Martins observed the longest cleavage; it began at
of the ground, and rose upwards to $7^{m}\cdot50$; the tree was br
middle of this length. Beeches were likewise the only tre
which, four in number, remained standing after having be
the surface of the ground for a third or fourth of their

up to a height of from two to five metres. These trees in every respect resembled trees struck with lightning.

The cleavage of poplars differs much from that of the trees we have mentioned; instead of being parallel, the planes of cleavage are perpendicular to the rays of the tree. The greatest breadth of the laths is in the direction of the layers of white wood, which are separated from each other and disjointed. Sometimes even the wood may be drawn out from the white wood, as we withdraw the piston from a pump.

In the valley of Montville, no resinous tree (pines, firs, larches) was cleft. M. Martins counted twenty of them more or less injured, but none were cleft; although they were in the direct passage of the storm, and surrounded with others whose trunk was like a bundle of laths. Now, we know that the coniferæ contain little sap, but much resin, especially between the bark and wood. The resin being a body which is a very bad conductor of electricity, we suppose that the fluid did not traverse these trees. This observation is a new proof that the cleavage is owing to the evaporation of the sap heated by an electrical current of great energy.—*Jameson's Journal*, No. 93.

VOLTAIC IGNITION.

MR. GROVE has read to the Royal Institution, a paper "On Voltaic Ignition," introducing his subject by asserting that the only philosophical idea of heat was that which regards it as a repulsive power—that, with the single exception of water and other bodies which assumed a crystalline form when about to freeze (a condition which Mr. Grove ascribed to a polar state which these substances then took), all matter expanded by heat. Mr. Grove here referred to the experiments of Fresnel and Saigy on discs in vacuo, and the still more recent researches of Prof. Baden Powell on Newton's rings, as showing the repulsive effect of heat, measured by tints of light. This expansion of matter, so caused, can be communicated to neighbouring bodies. In the case of heat produced by intense chemical action, the effect was ascribed to the physical force of a species of molecular friction on the particles acted on. This chemical force is capable of transfer by the voltaic battery, and the calorific force moves with it. It was proved by an experiment on a compound wire of silver and platinum, that, in proportion to the increase of conducting power, ignition was diminished. Mr. Grove here referred to recent researches of his own to prove that this calorific action was affected by external causes. The same current was sent through two coils of fine platinum wire, one of which was surrounded by an atmosphere of air, the other by an atmosphere of hydrogen, when it was found that the wire in air became white-hot, while that in hydrogen was ~~ut~~ heated. This phenomenon Mr. Grove ascribed either to the m• way, of the particles of the hydrogen, or to the vibrations movi y being from the vibrating surface, or to the state of the surface itself ply of the gen being, as to radiating power, to air what the colou for the prowhite. *That this cooling* effect does not depend on m.

proved by the intense heat and light produced by the current in vacuo. Mr. Grove then proceeded to show how the chemical force in the battery acted on masses of matter interposed in the circuit. He exhibited, first, the attraction of gold-leaf terminals, and then explained how liquid masses similarly attracted each other, and noticed a remarkable experiment lately performed by him with M. Gassiot's large battery of 500 cells (Grove's battery): of the two platinum poles, the positive was placed under water, the negative held over it, when a cone of flame issued from the surface of the water towards the negative pole, on the extremity of which a small globule was formed, which fell off as soon as the current was suspended. These facts may serve to explain more clearly the phenomena of the voltaic arc. Mr. Grove then exhibited paper on which the strong disruptive effect of the electric battery had dispersed metallic wires, and he showed that these explosions had always occurred in a line transverse to that of the current. He inferred that when ignition commenced in the wire its molecules assumed a transverse polar direction. He stated that when platinum is ignited by the current under circumstances which admit of the effects being accurately noticed, it contracts, swells, and breaks, and that a lead wire, similarly acted on, becomes divided by a series of transverse facets. In conclusion, Mr. Grove adverted to recent endeavours to obtain voltaic light for practical purposes. After noticing that no greater power of producing light had been obtained since the invention of his nitric acid battery, nine years ago, Mr. Grove stated that recent calculations led him to believe that for some purposes, such as the illumination of light-houses, especially where an intermittent light was wanted, and of the interior of large buildings, it might possibly be adopted at no very remote period. He mentioned that the light of 1,440 candles might be obtained at about 4s. per hour; but this concentrated light was not applicable for streets. The whole subject, however, was beset by many mechanical difficulties.

ELECTRIC STEAM INDICATOR.

AN ingenious application of Electricity has been made by Mr. Arthur Dunn, by means of which Signals are given that indicate the pressure of steam in the boiler of an engine. Tubes being filled with mercury are made part of a galvanic circuit, and connected with bells as the mercury rises from increasing pressure in the boiler; the circuit is thus completed, and the bells respectively run, indicate the amount of pressure. In this way, attention is called to the condition of the steam the moment it exceeds its ordinary condition.

HJORTH'S ELECTRO-MAGNETIC MACHINE.

THE patentee of this invention (Mr. Hjorth, a native of Denmark), that M.—
of the gr not confine myself to the use of wrought iron in the Magnets
middle of ures, which may be made of cast-iron or other metals, or
which, four which may be made magnetic. It will also be obvious that
the surface of s well as the attractive powers of metals or other sub-

ces may be rendered available for the same purposes by means of aratus constructed and arranged in a manner similar to that herein cribed.

The motive power obtained by the arrangements above debed may be employed for all purposes in which power may be rered, by the addition of the ordinary apparatus used for such pures. Thus, the power may be rendered applicable for raising ghts, and especially for raising the ram of a pile engine, or a heavy amer. In these cases I should prefer applying a magnet, conicted according to my arrangement, immediately over the ram or imer connected with it by a wet chain or rope, and moving with it guides. On the side of the frame or guide, adjusting tappets ild be fixed, by means of which the connection with the battery ild be cut off at any required portion of stroke.

Iy invention relates to certain improvements in the use of electronetism, and its application as a motive power for general purposes, also to certain improvements in the application of electro-magnei to engines, ships, and railways.

Iy improvements in the use of electro-magnetism, and its applicaas a motive power for general purposes, relate to a mode of obing such power by the reciprocal or rotatory motion of magnets, or tro-magnets.

Iy invention consists in obtaining such power by means of mag-, or electro-magnets, both fixed and moveable, formed and ared in such a way, that during the motion of the moveable magnet, magnets, separate points or parts of the surface of the moveable net or magnets, or metallic armatures of the poles of the several eable magnets, shall be brought separately and successively to act a, or be acted upon by the separate points, or parts of the surface or s of the fixed magnet or magnets, or metallic armatures, and so the attraction or repulsion of one point, or part of the surface or , shall be followed up by the retraction or repulsion of another it, or part of the surface or pole, so that a rotatory or reciprocal on may be obtained, and sustained over a greater length of stroke ircuit, than by the simple action of magnets or electro-magnets nged in the ordinary manner.

irst. I claim the constructing, arranging, and combining magnets uch a way that they exercise their attractive or repulsive power ually, by a continuous and direct attraction or repulsion upon its presenting themselves successively during the whole stroke, in for the production of motive power by means of electro-magnei.

econdly. I claim the regulating the current of the electric fluid by wing the same to pass through bodies with surfaces of different ensions, touching or rubbing upon one another in such a way, the areas of the said surface are diminished or increased by being ed by a governor, thus allowing a greater or smaller supply of the tric fluid to pass, according to circumstances, in and for the protion of *motive power by* means of electro-magnetism.

Thirdly. I claim the changing the direction of the current by means of a commutator constructed as above described, in the use and application of electro-magnetism as a motive power.

Fourthly. I claim the use of electro-magnets adapted to, and in combination with, engines and carriages on railways, as above described, for the purpose of increasing the adhesion of the wheels, and as an auxiliary power for magnets on railways, or stationary and marine engines, as before described.

Fifthly. I claim the arrangements before referred to for producing rotatory motion by a direct pull or thrust, and continual succession of polarities, as above described.

Sixthly. I claim the arranging and combining magnets constructed as described, so that a semicircular motion, or a reciprocal rotatory motion of the moveable magnet maybe obtained, and the power transferred thence, either directly to the work, or through cranks to a revolving shaft.

Lastly. I claim the combining the several arrangements before described and referred to, for the application of electricity as a motive power to engines, ships, and railways.

NEW ELECTRIC CLOCK.

AMID the many practical advantages which are derived from the application of magnetic electricity to telegraphic purposes, attention must be drawn to the great importance of the use of the Electric Clock for scientific observations. Although the beautiful arrangements of Prof. Wheatstone have excited much attention in this country,—and some modifications of his plans been produced,—we have not yet applied this means of registering the beat of the foot of time in its passage to any useful end. In the United States, however, the electro-magnetic chronograph of Prof. Locke, having been reported on by Prof. Bache, Superintendent of the Coast Survey, is now adopted by the Government; and the Congress have appropriated ten thousand dollars to Prof. Locke for a clock upon his plan to be erected by him at the National Observatory of Washington. The Report of Mr. Walker, Secretary of the Treasury, gives the best description of this clock, quoted in the *Athenæum*, No. 1126:—

"It consists in printing instead of recording the dates of astronomical events on the running fillet of paper of Morse's Telegraph Register. An astronomical clock of the most delicate construction has an apparatus attached to the arbor of the second's hand, so as to make and break the galvanic circuit every second. By putting it in connexion with the telegraph line of Morse's at any place on the line, the paper is graduated automatically with the hours, minutes, and seconds. The rate of movement of the clock is not in the slightest degree affected by its action. The paper so graduated is called the *automatic clock register*, and has all the precision for days or months in succession, of the most perfect astronomical clock. Each second consists of a line some nine-tenths of an inch in length, imprinted on the fillet of paper, with a blank space for the remainder of the second. The as-

mer at any station on a line of several thousand miles in length, imprint on this register the date of any event, by simply tapping, the manner of playing upon a piano, upon a break circuit key. imprints in the indented line a corresponding break circuit space. or three spaces may be printed in one second, if desired. Two ıds of time is ample for the equatorial interval of the wires of a sit instrument. The network of spider lines is divided into some or more tallies, or distinct groups of five wires each. All these es, in the case of the transit of a star, are imprinted on the register he time occupied by the ordinary method for a single tally, to ch a transit has been usually limited. The skill required for tap- g on the key at the instant of the bisection of a star is easily ac- red, and the accuracy of each imprint is much greater than that of ngle record by the common method. The imprints furnish a per- nal record of the date of the event, and may be read off with great dity to the hundredth of a second by means of a graduated scale he paper used for registering. This process has been employed the first time in the Coast Survey operations; but it will be of t use for the general purposes of practical astronomy."

CHAIN PIPES FOR SUB-AQUEOUS TELEGRAPHS.

[R. WHISHAW has submitted to the British Association, three s of a full-sized Pipe for inclosing the wires of electric telegraphs rossing rivers, &c. As the title implies, the pipe is formed by so y links connected together by sockets: each link varies according ircumstances from 18 inches to 24 inches in length, and from 1 to 2¼ inches internal diameter, according to the number of wires e inclosed. These pipes being of wrought iron are exceedingly ng, and are required merely as a protection to the wires, which are iously insulated by means of gutta percha. Pipes of somewhat lar construction are laid under the Rhine and other rivers in ssia, where the underground system of telegraphs is adopted by the ssian Government (already to the extent of 1200 miles), although y of the railway companies suspend the wires between posts, as ctised in England, America, France, &c.

ELECTRICAL PROPERTIES OF GUTTA PERCHA.

CORRESPONDENT of *the Athenæum*, No. 1119, writing from erpool, March 26, calls attention to this quality, which Gutta cha possesses in a remarkable degree. If a piece of sheet gutta per- be laid upon a table-cloth or silk handkerchief, and stroked ckly with the hand, and then lifted from the table, it emits brilliant hes of electric light, and considerable sparks may be drawn from it any conducting substance. The ease with which gutta percha is ited contrasts strongly with the difficulty of exciting glass and re- ous substances, especially in damp atmosphere; and there can be doubt that it may be successfully employed to produce large quan- es of electricity. The machine for this purpose may be extremely

simple: an endless band of sheet gutta percha stretched over two rollers (one of them turned by a winch), pressed slightly by a cushion, and having a rod or wire touching the revolving band, and in connection with the conductor of an ordinary electrical machine, would produce a constant supply of electricity, in a quantity proportioned to the surface employed, which may be very considerable. The writer adds as a useful hint to experimenters with the sheet gutta percha, that it may be readily joined by laying the edges together, and cutting off a shaving with a pair of scissors moderately beaten.*

SUBAQUEOUS ELECTRIC TELEGRAPHS.

In January last, some experiments were made at Folkestone Harbour, under the direction of Mr. C. V. Walker, and on board the Princess *Clementine* railway steamer.

Upwards of two miles of wire were, therefore, carried out in a small boat, and submerged in the sea along the mouth of the harbour, and at the side of the pier. One end of the wire was connected with a telegraphic instrument on the deck of the steamer, and the other end with the telegraph wire communicating with London. The arrangements having been completed, about half-past twelve the telegraph was placed in communication with London, and messages were sent by Mr. Walker to the chairman of the South-Eastern Company (Mr. Macgregor), to apprise him that the experiment was entirely successful. These messages passed through the couple of miles of wire "payed out" at sea and in the harbour. A correspondence was then kept up between the Princess Clementine, and the stations of London, Ashford, and Tunbridge, which was continued with the most perfect success at intervals for three or four hours,—messages being interchanged between the steamer and all those stations. The bells at the electric telegraph offices at Tunbridge and London Bridge were vigorously rung by the instrument on board the Princess Clementine, and no greater difficulty was experienced in making the signals with the sub-marine wire than with the ordinary wires on land. The wire employed was of the total length of 3,600 yards; and was made in accordance with a suggestion from Mr. Walker, in order to obviate the difficulty experienced in working the telegraph wires in tunnels, where they are exposed, not to the effects of damp and water merely, but to water impregnated with earthy matters, and with acid vapours from the engine,—causing a communication between the wires, and allowing portions of the current to escape to the earth. The size of the wire used is No. 16 copper wire, and its thickness, when covered with gutta percha, is nearly a quarter of an inch thick in diameter. The wire used is now employed in the Merstham Tunnel, and a similar wire is placed in all the tunnels on the line,—the Shakspeare, Abbott's Cliff, and Martello Tunnels, being already provided with wire of this kind. The defective insulation of the wires against which this

* A valuable paper by Mr. Faraday, "On the Use of Gutta Percha in Electrical Insulation," appeared in the *Philosophical Magazine* for March, 1848; and is quoted in the *Year-book of Facts*, 1849, p. 153.

-wire was intended to provide, has been the only serious practical ulty which has had to be overcome in working the electric tele-. Hitherto, the working of the wire, as covered with gutta a, in the tunnels, has been very satisfactory; and its durability, the complete insulation which it effects, appear to have suggested plicability for the purposes of submarine telegraphic communi-m. The wire is patented by Mr. Foster, of the gutta percha ufactory at Streatham, who assisted at the experiments.

pecimens of wire were exhibited on board; one or two of them g probably better adapted to the experiment of a communication s the thirty miles of channel than the wire actually used. Among were specimens of Nos. 8 and 14, galvanized iron wire, and three-ed No. 16, copper wire, and also the single copper wire used in above experiments; but all of these were coated much more ly with gutta percha than that actually used, some of them being, e whole, nearly three-quarters of an inch in diameter.

subaqueous Telegraph has also been laid down by Mr. Reid, of lon, between the New Railway Station, and the Company's Sub-tion Rooms at Hull; the difficulty arising from the wires passing Docks, where the depth of water varies from 18 to 24 feet. There four copper wires insulated. Each wire was tested singly a galvanic battery of 72 pairs of plates connected with a very ite galvanometer; and the insulation between each wire, and etween the wires and the earth, was so perfect as not to produce east perceptible oscillation in the magnetic needle of the in-ient.

THE ELECTRIC LIGHT.

the *Year-book of Facts*, 1849, page 163, will be found a popular unt of this novelty, to the close of the year 1848.

Jan. 12, 1849, the specification of the patentee, Mr. Staite, completed; and it will be found quoted in Nos. 1328 and 1329 of *Mechanics' Magazine*. The result is thus noticed in the *Athe-*, No. 1108:—

The battery, which was promised to be so inexpensive, involves e elements of Professor Daniell's battery; and although the anical arrangements are sufficiently new to obtain a patent, and ertainly ingenious, we have to derive the power which is to be erted into light from zinc and copper. The simple question now e cost of production; which, we fear, must prove a barrier at nt to the general use of electricity as an illuminating agent. The nercial value of sulphate of zinc being exceedingly small, Mr. e proposes to convert it into carbonate by adding to the waste ion of the battery the sesquicarbonate of ammonia; which, he s, may be employed in the same manner as white-lead now is, as gment. Again, Mr. Staite claims the use of platinized lead, h, when acted upon by dilute nitric acid, gives rise to nitrate of which, being treated with the bicarbonate of potash, produces ordinary *white-lead of commerce*. Again, plates of iron are

included in the specification, by the use of which sulph formed; and, of course, in all these forms of battery, th in solution is precipitated. With this information we m readers to make their own calculations as to the cost of light."

Meanwhile, MM. Achereau and Fourcault, of Paris, e beautiful phenomenon of electric illumination: their light have been exceedingly steady, but we do not find that they in producing a battery of sufficient simplicity or economy its general use.

Some interesting researches of M. Maas, of Namur, on th nical transference of ponderable matter from the positive negative pole when the electric current is established in a appear to point out other difficulties in the mechanical adjustm

In the United States, we find Mr. Paine, of Worcester, chusetts, successful in generating light by mechanical action water and lime. Mr. Paine states that he has produced a light in intensity to that of four thousand gas-burners of the largest b wing pattern, with an apparatus occupying four square feet of ro at a cost of one mille per hour; the current of electricity being evol by the action of the machinery, wound up with a common lock and the only materials consumed are water and lime.

The cost of the electric light has been treated of by Mr. Grove, a lecture delivered by him at the Royal Institution. Mr. Gro made some experiments, six years ago, on the subject, and then one occasion delivered a lecture at the London Institution, when the theatre was illuminated by the voltaic arc. In preparing the present lecture, he had made a rough calculation as to its expense, and the matter appeared to him (though attended with many practical difficulties) to be hopeful and promising. By interposing a voltameter in the circuit while the arc was produced, the consumption in the battery could be calculated; for every chemical equivalent of hydrogen evolved in the voltameter, an equivalent of zinc, of sulphuric acid, and one-third of an equivalent of nitric acid, would be consumed in each cell of the battery. Supplying these data for calculation, and making proper allowance for the amount of water contained in the commercial acids, &c., the theoretical expense of a battery such as he was exhibiting (fifty cells of the nitric acid combination, each platinum pl two inches by four) would be about two shillings an hour.

He had tested, by the photometric method of equality of shadow the intensity of the light as compared with a common wax candle, found that after the battery had been an hour at work, the vol light was to the candle as 1444 to 1. He did not take this co parison of intensities as an absolutely fair practical comparison, did he give the above as a practical calculation, but thought it w be safe if twice that expense, or four shillings per hour, were assum the actual expense of charging a battery for a given time of a bore this out. He showed the inferiority of central as compared separate lights for street illumination; but for lighthouses, part

for an intermittent light at regular intervals, or for signal-lights, pplication appeared to him to be reasonably approximate, and, iore general purposes, far from hopeless; the practical difficulties, gh undoubtedly not small, being, in his opinion, by no means mountable.

he difficulties of the process are thus stated by Mr. Rutter, who o ably illustrated the economy of gas-lighting:—

Those who understand the details of the Electric Light process,* ot wonder that the electric light is intermitting and uncertain. naintain at a high intensity an uniform power in a voltaic battery, fficiently difficult; to adjust the carbon points, even by the aid of most ably-constructed machinery, is apparently impossible. In-se or diminution of power in the battery renders necessary a new stment of the carbon. Differences in the quality of the latter, or admixture of impurities, also interfere with the success of the rations. Machinery, however sensitive, cannot adapt itself to e constantly varying conditions. It may be perfect in its motions, exact in its graduations, but still it cannot *think* about its work, know what it has to do; and hence, in this instance, it fails in forming all that is required. At one period of the process, the on point may probably be required to move at the rate of $\frac{1}{100}$th n inch at a certain time, at another the required rate may be th, or $\frac{1}{10000}$th of an inch in the same time. Herein consists e of the practical difficulties. These are only a small part of n.

As respects cost, nothing at present need be said. It will be : enough to discuss the economy of the process when all other ctions, and especially those of manipulation, are cleared away. electric power could be obtained without cost, that would not aid invention. The causes of failure are more recondite than the es of acids and of metals. In the present state of our knowledge, notwithstanding all the so-called recent improvements, the electric t remains, what it has hitherto been, a very impressive, and very liant philosophical experiment, and nothing more."

t the late meeting of the British Association, in Birmingham, in nversation on the economy of the electric light, and electro-netic machines, Mr. Faraday remarked on the imperfect character ie electric light, and its inapplicability for purposes of general ination: all objects appearing dark when the eye was embarrassed ie intensity of the electric arc. Mr. Shaw and Dr. Percy in-ed the magneto-electric machines which are employed at Bir-ham for electro-plating, in which the current cost of the motive r—viz., a steam-engine to put the magneto-electric machine in

he light is produced by a current of electricity, generated by a powerful c battery, and which is transmitted through small cylinders of carbon oal) extremely hard, and as pure as it can be obtained. The points of irbon are not in contact. The light is formed in the space between and is caused by the interruption of the electrical current in passing ne piece of carbon to the other.

action,—was the only working cost. Mr. Elkington stat had never been induced to abandon the voltaic battery employed in his manufactory, finding it more economica magneto-electrical machine of which he was the patentee stated the remarkable fact, that a few drops of the sulphure added to the cyanide of silver in the decomposing cell, h perty of precipitating silver perfectly bright, instead of be lated so dead as it is when thrown down from the solutions employed.

PROBABLE CAUSE OF CHOLERA.

On August 28, 1849, when Cholera was raging in Lo Robert Hunt addressed to the *Athenæum*, No. 1140, suggestive letter "On the Probable Causes in operation Pestilential Cholera." In this communication, Mr. Hunt malignant disease to be produced by a subtle organic poi under some peculiar atmospheric laws; the probability of admitted, he examines the prevailing conditions observ physical phenomena during the reign of the epidemic. At burgh, magnets lost their power; and in Paris electrica would not give out sparks during the ascendancy of chole cities. M. Quetelet has proved, by careful observatio electrical intensity of the atmosphere was, during the about one-half of that observed in former years; that regularly diminishing since January up to a certain perio it had appeared for some time stationary. These results, competent observers, demand serious attention.

Mr. Hunt next notices the constant production of oz atmosphere under every circumstance which determines trical or chemical changes;* its amount appearing to va ratio with the electrical intensity. We may produce it in exciting an ordinary electrical machine, when it is detected peculiar smell; we obtain it during the decomposition the voltaic battery in combination with the liberated ox Schönbein has proved that ozone is formed in every combustion.

The use of this agent in the atmosphere is then glan living animals and vegetables are constantly throwing off bodies organic matter in a condition the most fitted for re with the chemical elements of the air. The gaseous exhal all dead matter are also constantly combined with organic a state of extreme division. Thus, the atmosphere is receiving exhalations from the earth and its inhabitants whi a provision for their removal, would speedily become fa jurious to all forms of life than carbonic acid: though to we have been in the habit of too commonly attributing a deterioration.

* See also "Ozone in the Atmosphere," *Year-book of Facts*, and "*New* Test for Ozone," in the *Year-book*, 1848, page 174.

Ozone combines with, and changes in the most rapid manner, all animal matters, except albumen in its fresh state. Mr. Hunt is, therefore, disposed to consider it as the great natural agent employed to convert all those deleterious exhalations which the air receives into innocuous matter. An atmosphere artificially charged with ozone immediately deprives the most putrid solid or fluid bodies of all disagreeable smell; and sulphuretted hydrogen is instantly decomposed by it. In fact, its action upon organic matter is far more energetic than that of chlorine; and indeed the bleaching and disinfecting property attributed to chlorine appears to be due to the formation of the per-oxide of hydrogen by that agent from the water present.

It has been proved that the electrical intensity of the atmosphere has during the year been diminished in a remarkable manner. As this is the great cause, ever active, in producing ozone, we might *à priori* infer a relatively diminished quantity of this chemical agent: and experiment has proved that during the three months previous to August an appreciable quantity of ozone could not be detected by the ordinary methods in the air of London. Its presence is rendered evident by its action upon a mixture of iodide of potassium and white starch; iodine is liberated by the action of ozone, and the formation of coloured iodide of starch indicates its presence.

Certain it is, that we have for several months had to endure an atmosphere of low electrical intensity, deficient in ozone—an agent which would remove, or alter, pestilential miasma.

In the history of the progress of this pestilence, two remarkable instances present themselves to our notice. Birmingham and Berlin have remained free from the scourge, while all cities and towns around them have been visited by it. Are the metallic manufactures of these towns active in producing this disinfecting agent, ozone?

Mr. Hunt then suggests that, as one of the means of restoring to the air this principle which it requires—since we know that ozone is formed in the process of combustion, and that large fires have proved again and again effectual in stopping the progress of the plague, &c.—bonfires, heavy discharges of artillery, and the like agents might be tried in the worst districts.

A remarkable incidental corroboration of these views appeared in a letter of the Berlin Correspondent of the *Times*. While the cholera was at its greatest height in a village in the district of Magdeburgh, a fire broke out, and threatened the whole place with destruction. Three persons lying ill of the cholera had to be carried out of a house, through the flames: it was expected that the terror would increase the disease, but it is a singular fact that the reverse occurred; there was not subsequently a single case, and the persons rescued from the fire recovered.

About this time, a letter addressed by M. Audrand to the Academy of Sciences of Paris, respecting his experiments on the absence of electricity in the atmosphere as leading to the increase of epidemic diseases, especially cholera, excited much attention in Paris.

M. Audrand tells us that he made daily observations of the action

of the electric machine, in order to ascertain if there is relation between the intensity of the scourge and the al electric fluid, habitually spread in the atmosphere. Th ordinary weather gave, after two or three turns of the wh sparks of five to six centimetres. He remarked that si sion of the epidemic he had not been able to produc occasion the same effect; during the months of April sparks, obtained with great trouble, never exceeded two timetres, and their variations accorded very nearly with of the cholera. In fine weather and heat, the machi showing, as it ought to have done, an augmentation gave signs less and less sensible, to such a degree that du of the 4th, 5th, and 6th of June it was impossible to ob but slight cracklings, without sparks. On the 7th, the mained quite dumb. This new decrease of the electric f accorded with the renewed violence of the cholera.

M. Audrand next records that on the morning afte Paris, and when electricity re-entered its domain, the the least touch, gave out sparks. In conclusion, the w that not only cholera, but perhaps all the epidemics, a the decrease of electricity in the atmosphere.

THE ELECTRIC TELEGRAPH IN ENGLAND, PRUSS AMERICA.

MR. WHISHAW has communicated to the British A paper illustrative of the advantages and disadvantages great systems of Electric Telegraphs now in operation Prussia, and America. In England, the wires, being sus post to post along the sides of railways, are exposed to disadvantages—running of trains off the lines, by whic wires are all carried away together, and thus the com stopped. Secondly, from atmospheric influences, wher and uncertain deflections of the needles in Cooke and telegraphic instruments take place, besides occasional d parts of the instruments, &c. Thirdly, from snow-stor case of the South-Eastern telegraph which occurred du winter, when the wires and posts were all removed, and interruption was caused in the transmission of com Fourthly, from damage by malicious persons, who som the wires together; and for whose apprehension rewar quently been offered by the English companies. Fifthl have sometimes been connected together by a fine wire ni to the line wires, and thus the communications have b from their right channel. Sixthly, the expense, viz. £ for the above-ground system, with an annual expenditure Seventhly,—and consequently, heavy charges for the tra messages. Eighthly, the time required in learning perf nipulations of the needle telegraph, so that if a telegr any cause disabled, there is no one at hand to take his

With regard to the charges, the following facts will suffice to show the advantages of economical telegraphs. In America, the charge for twenty words transmitted by the telegraph to the distance of 500 miles is but 4s.; whereas by the English company's charges the same communication would only be transmitted 60 miles, or less than one-eighth the distance,—and by the South-Eastern Company's charges not 20 miles, or one twenty-fifth of the 500 miles. Again, a communication of ninety words in America may be transmitted from Washington to New Orleans, 1716 miles, for 41s. 8d.; whereas by the Electric Telegraph Company's charges it would only be transmitted a little more than 200 miles,—and by the South-Eastern Company's scale under 100 miles.

The extent of telegraphs in Great Britain at present is about 2,000 miles; and there yet remain railways to an equal extent without telegraphs. Mr. Whishaw expressed a hope that within a short time every principal town in the kingdom would be connected by telegraph, as the underground system may be effected without the aid of railways, viz. under turnpike roads and towing paths, &c. This plan has been practically carried out in Prussia, where at the present time there are 319 German miles =1492·92 English miles in actual operation. A single wire coated with gutta percha is laid under the railway at a depth of two feet, and connected with the instruments and batteries at the different stations. A colloquial and also a printing telegraph are used in each principal station—both worked as required by the single wire. The experiment as to burying the gutta percha wire in the ground was commenced some years ago, and being found to answer perfectly, the Prussian Telegraph Commissioner appointed in 1844 determined on adopting the underground plan entirely for the government telegraphs, and which were commenced in July 1848, so that no time has been lost in carrying them out. At Oderbay, the Prussian system is in connexion with the telegraphic line now in course of construction between that place and Trieste viâ Vienna; and as regards the Prussian Government Telegraphs, the public has the advantage of them by payment of certain fixed rates. The cost of the Prussian system is under £40 a mile.

The American system is remarkable for the great extent to which it is already carried, viz. 10,511 miles, costing less than £20 a mile. It consists of a single iron wire supported from post to post, but is carried far beyond the limits of railways, and is consequently frequently damaged, so that a code of rules is established for the repair of the wires, which is undertaken by gentlemen living along the lines, and who are furnished with a set of tools for the purpose—their reward being the free use of the telegraphs for their own private communications. The economy of first cost, however, causes a very low tariff for the transmission of communications, so that the poorest person is enabled for a few cents to send a communication to a considerable distance. From the actual operations of the three systems, it appears that the Prussian is the most simple, effective, and economical —for annual *repairs are not* required to the line wires, as in the

cases of England and America, where they are exposed to so many casualties.

Lieut. Maury, of the United States navy, says, in a communication to the *Athenæum* :—"The magnetic telegraph now extends through all the States of the Union, except perhaps Arkansas, Texas, and the other frontier; so that a splendid field is presented for doing the world a service by connecting, for difference of longitude through means of magnetic telegraph and clock, all the principal points of the country with this observatory (Washington). In anticipation of such extension of the wires, I ordered an instrument for the purpose, and it has recently arrived. It is intended to determine *latitude* also,—so that by its means and this clock I hope, during the year, to know pretty accurately the geographical position of Montreal, Boston, Chicago, St. Louis, New Orleans, &c., and their difference of longitude from this place, quite as correctly as the difference between Greenwich and Paris has been established by the usual method and after many years of observation."

EXTENSION OF THE ELECTRIC TELEGRAPH IN ENGLAND.

THE Electric Telegraph Company, Lothbury, having completed their arrangements with the Postmaster-General and the different lines of railway, for a further extension of the transmission of messages, or expresses, from their branch office at the General Post Office, St. Martin's-le-Grand,—the public can, by this facility, send any information to the following places at the rate of 1d. per mile for the first 50 miles, ½d. for the second 50, and ¼d. per mile for any distance beyond 100 miles (for 20 words) :—Alnwick, Attleborough, Ambergate, Broxbourne, Birmingham, Burton-upon-Trent, Barnsley, Beverley, Bridlington, Bradford, Berwick-upon-Tweed, Bishopstoke, Chelmsford, Colchester, Cambridge, Cheltenham, Chesterfield, Derby, Durham, Dunbar, Darlington, Ely, Edinburgh, Gloucester, Gosport, Glasgow, Hertford, Hull, Halifax, Ipswich, Lincoln, Loughborough, Leicester, Lowestoffe, Leeds, Liverpool, Leith, March, Melton, Manchester, Malton, Morpeth, Newcastle, Newmarket, Newark, Nottingham, Norwich, Northallerton, Normanton, Peterborough, Romford, Rugby, Rotherham, Rochdale, Slough, Stortford, St. Ives, Stamford, Sheffield, Selby, Skipton, Scarborough, Sunderland, South Shields, Southampton, Thetford, Tamworth, Todmorden, Thirsk, Witham, Wisbeach, Worcester, Wakefield, Ware, York, and Yarmouth.—[illegible] establishing a branch office at St. Martin's-le-Grand is a great fac[illegible] to that department, in receiving intelligence of the arrivals and [illegible]partures of the foreign and colonial mails from Dover, Southamp[illegible] Liverpool, and Falmouth,—for the transmission of orders to the [illegible] masters, and others throughout the country,—and for other of[illegible] purposes.

ELECTRO-TELEGRAPHIC ALARM.

Mr. BROTHERTON, of Preston, has patented an invention f[illegible] *vention of* accidents on railways. It consists of an electric [illegible]

fixed beneath the rails, on which the wheels of the train act as they pass over it. A wire connects this apparatus with any station or junction which the train may be approaching, and at which an electric alarum is fixed. By this invention, the attendants at any station or junction may, it is said, be apprised of the approach of a train any number of miles off; and in case any obstruction exists, a signal can be immediately forwarded to the train.

DISTURBANCE OF THE ELECTRIC TELEGRAPH BY STORMS.

MR. E. HIGHTON has described to the British Association, the various Disturbances of the Electric Telegraph in England, in 1847 and 1848, with an extensive detail of the deflexions of the needles caused at various stations and at various times by terrestrial or atmospherical influences on the wires, both by day and by night: the results being frequently tabulated from minute to minute for hours together. These influences often entirely disturbed the regular transmission of signals,—frequently set the alarums ringing,—sometimes affected the down groups of needles, and left the up groups quite undisturbed, then soon after affected the up groups, but neglected the down ones,—sometimes affected the wire from a certain station to another distant one, leaving the rest of the same wires quite undisturbed.

Mr. C. V. Walker, the Telegraph Superintendent on the South Eastern Railway, has published an account of the ravages of the snow-storm on April 19, 1849, by which many of the telegraph poles were disturbed or destroyed. At night, when frost attended the snow, it began to congeal with the rain about the telegraphic wires. This process continued until the wires along the whole length were each enclosed in a coating of snow about the thickness of a man's arm: this accumulated weight required little aid from the wind (which indeed blew a gale) to bear down the poles. Before midnight, some 60 or more poles, either singly or in sets of two, three, and in some cases of four or five, were broken short off at the ground, and as many more were overthrown. Next morning, on examining the snow cylinders, Mr. Walker estimated that each yard of wire sustained snow to the amount of ten or twelve pounds; this would give between two and three thousand pounds for each pole, and in some cases double this weight. The first effect was to depress the wires; andit was a magnificent sight to behold the four festoons of congealed snow, 65 yards in length, and descending within arm's reach from heights of 12 feet and upwards. Here and there a wire gave way beneath the pressure, but this was an exception to the general rule; for in most cases where the poles remained firm, the wires recovered their original position or nearly so. The wire is No. 8 iron-wire galvanized.

An interference of another kind is recorded to have occurred on the electric telegraph line between Berlin and Strettin. The communication having been found interrupted, search was made for the cause, when a mouse's nest, with a little brood, was discovered in the gutta percha tube, which the mouse had contrived to gnaw through and disturb the wires.

With the view of protecting electric telegraphs from such disturbances as those above related, Mr. Walker has invented a very ingenious lightning-conductor, which appears to prevent these casualties. This conductor consists of a vertical wire furnished with radiating points, and a bobbin of finer wire than any used elsewhere on the instrument. It is surrounded by a small brass cylinder connected with the ground, by which arrangement the lightning-charge has the best possible course to the earth. Any overcharge would burn the little coil of wire, and escape to the earth without injuring the instrument. This actually occurred at Tunbridge Wells during the storm on April 19.

Mr. Lake, of Gosport, has devised the following means of protection. It consists of pairs of lightning-conductors at intervals of about thirty-six feet, or at each of the wooden supporters of the telegraphic wires, the conductors being placed one on each side of the wires, from which they should also be equi-distant. These conductors are to be constructed of round iron, with all the usual precautions; and their points at top to be three inches apart, that each may receive an equal quantity of electricity from the atmosphere at the same time. Two conductors are employed at each point, that the one may neutralize any current that may be induced in the wires by the other when the conductors are struck by lightning.

Similar disturbances of the telegraphic needles take place during the appearance of Aurora Borealis, and sometimes during the day when no Aurora is visible. Mr. Highton relates a curious disturbance of this kind which took place in the Watford tunnel. On this occasion, the magnets were rendered useless during three hours—being constantly deflected to one side. Now, as these disturbances are dependent entirely on the earth's magnetism, and in no way connected with the ordinary manifestations of atmospheric electricity, a method is still wanting for preventing the interruption.

TALL TELEGRAPH POLES.

PROBABLY, the "tallest" specimen of Telegraph Poles in the world is to be seen where House's Philadelphia line crosses the Hudson River. On the New York side, a single pole has been erected, the peak of which is over 400 feet above the surface of the river. On the Jersey shore, the pole is erected on the Palisades, close by Fort Lee, and its peak is about 750 feet above the river. The distance between the two poles is about one mile, and two steel wires are suspended across; probably the most successful achievement of the kind. —*Scientific American.*

Chemical Science.

HEAT OF COMBINATIONS.

ANDREWS has communicated to the British Association, the)f this investigation, which is of the highest scientific interest. olecular change in the condition of matter is almost invariably :d with the evolution or the absorption of Heat; and the of heat thus set free or absorbed bears always a definite to the amount of the mechanical or chemical action. To ascer- relation has been the object of Dr. Andrews. The following r of the principal points:—1. The solution of a salt in water s accompanied by an absorption of heat. 2. If equal weights iame salt be dissolved in succession in the same liquid, the orbed will be less on each new addition of salt. 3. The heat l by the solution of a salt in water holding other salts dis- is generally less than that absorbed by its solution in water. heat absorbed by the solution of a salt in the dilute mineral generally greater than that absorbed by its solution in water. ntire Report will be published in the Journal of the Asso-

PHENOMENON OF EBULLITION.

Phenomenon of Ebullition, bearing as it does on the construc- steam-boilers, and on the economic and safe application of ıs occupied the attention of several of the most intelligent l engineers both at home and abroad. M. Donné, in 1844, by a series of ingenious experiments, that water deprived of ht be heated considerably above 212° without boiling; and the introduction of even a small quantity of water containing llition commenced with explosive violence. In this manner it)ught many steam-boiler explosions might be explained. .yet regards ebullition as a very rapid evaporation, operating e interior surfaces of the liquid which surrounds a bubble of ı fluid; and he proposes the following general conclusions as ılts of his researches:—

If we suppose a liquid mass freely suspended in the air, and ed to a source of heat, the temperature of ebullition depends upon atmospheric pressure, and is, consequently, constant he same pressure. 2nd. As in vessels of glass or metal plas- 'ith certain substances, the water boiling, and the vapour from their surfaces, are exactly of the same temperature, it that these substances, which do not exert much molecular ɔn upon water, do not consequently retard the point of ebul- 3rd. If the water is contained in a vessel of which the sub- ır the form are of a nature to exercise a great attraction upon attraction considerably retards the point of congelation, and t of *ebullition*. *4th*. Relying upon the preceding considera-

tions, we can explain the different phenomena observed by M. Donné, without the necessity of supposing the intervening cohesion of liquids. The practical value of such researches will be readily seen: showing as they do particularly, the danger which may arise from allowing earthy incrustations to accumulate in boilers.*—*Athenæum*, No. 1121.

POLARIZATION OF LIGHT.

M. L. Pasteur, in a paper read to the Paris Academy of Sciences, states that he has availed himself of M. Biot's beautiful discovery of the influence of chemical composition in altering the rotation of Polarized Light, to show that the tartrates and paratartrates differ from each other only in the form of their crystals.—*Athenæum*, No. 1110.

ON RENDERING SUBSTANCES INCOMBUSTIBLE.

Dr. R. A. Smith has communicated to the Manchester Literary and Philosophical Society, a paper on this subject. Dr. Smith prefatorily observes:—

"Silicate of potash has been considered good. It is a soluble glass which was expected to cover the fibre of cloth or wood, and so protect it from heat. This does act to some extent, probably in the same manner as stones do when put into a fire of wood or coal; they take heat, but give none, and are also bad conductors. If silicate of potash remained as a glass, it would act also by keeping out the air; but this does not seem to be the case, as it falls after a time to a powder.

"It struck me that the mode of preventing combustion was not by protecting the wood from the fire merely, as heat must cause combustible gases to rise from wood, whether there be incombustible substances mixed with it or not, and these gases will force their way to the surface where there is no longer any preventive to burning. My object, then, was to find a substance which would render the wood unfit to burn, and would cause it to give out gases which would not burn; so that whilst the wood itself was being preserved, except where in contact with the fire, the gases would assist in extinguishing the fire.

"I first tried phosphate of magnesia and ammonia, thinking the ammonia given out would be of use in extinguishing the fire: but this was of no value, as a piece of calico required to be made quite stiff with it before it was rendered incombustible. The calico was prepared by dipping in a solution of phosphate of magnesia, in muriatic acid, and then in ammonia. It seemed to me that the earthy salts are of little use for the purpose required, and that the amount of solid matter incapable of evaporation left on the cloth assists in a very small degree.

"Sulphuric acid, however, seemed to present the most promising characteristics of a substance incapable of burning, and of acting so strongly on vegetable substances as to make them incapable of burning. Sulphuric acid itself is a body perfectly burnt, or we may say overburnt, having an atom of oxygen given to it by artificial means, so to speak, which atom is difficult to separate, and therefore not resembling the oxygen of many highly oxidized bodies. It requires a high degree of heat to raise it to vapour; and the vapour formed is sluggish and heavy, remaining long where formed, and quenching flame wherever it is. It destroys the texture of wood also, and other vegetable substances, causing them to give out, after a time, gases which do not burn, mixed with some which do burn; but if there be enough of acid, forming a mixture which does not burn. The wood also cannot be again induced to become combustible until it be heated to redness, so as to *remove all the* sulphuric acid, leaving only charcoal.

* See *Year-book of Facts*, 1849, p. 181.

If sulphuric acid, then, could be introduced into wood just at the time that fire was about to take place, it would thus be prevented; and this can do easily by saturating the wood with sulphate of ammonia. When there is no fire present, there is no sulphuric acid present, as such; but as soon as the heat rises, ammonia goes off, and sulphuric acid is instantly presented to the wood. The ammonia does not come off quite pure, it is mixed with nitrogen and sulphurous acid; and this disengagement of gases is of advantage in extinguishing fire; when the heat rises to 536°, the sulphuric acid is then left to act on the wood in part, and to volatilize in part, and that which I have mentioned takes place.

I have no doubt that a house built of wood prepared in this manner might have a fire lighted on the wooden floor without danger, burning only on the part to which the fire was limited. A ship also would be safe, even if the cinders fell from the grate in stormy weather.

"Sir William Burnett's liquid is chloride of zinc: he uses it for preserving wood and canvas, and also for preventing fire. I am certainly surprised that more use has not been made of it, being, as far as I have seen it, so efficient. I believe the manner in which the chloride of zinc acts is very similar to that of the sulphuric acid, destroying the organic matter on the approach of heat, and rendering it incombustible. It can be introduced into wood at a specific gravity of 2000, I believe; sulphate of ammonia cannot easily be used above 1130. By heating the solution more may be attained. Sulphate of ammonia is cheap, and easily procured and used, not hurting anything with which it may come in contact, and therefore more easily managed in households. It does not hurt colours; so that even coloured goods might be dipped when kept long in one place, or when sent in vessels abroad."

FLUORINE IN PLANTS.—THE SEA-PINK.

A PAPER has been read to the British Association, "On the Composition of the Ash of *Armeria maritima*, grown in different localities, and Remarks on the Geographical Distribution of that Plant, and the Presence of Fluorine in Plants;" by Dr. A. Voelcker. The presence of iodine in plants growing near the sea, and the absence of that element in the same species of plants growing in inland situations, were first noticed some years ago by Dr. Dickie, of Aberdeen, who likewise found that in the former soda was more abundant, and potash prevailed in the latter. The author found Dr. Dickie's observations confirmed by his own, and no qualitative analyses of the sea-pink (*Armeria maritima*) having been made, he analyzed the ashes of specimens from three different localities, and submitted the results. Traces of fluorine, hitherto found only in few plants, were distinctly detected in all three ashes; iodine only in specimens grown near the sea-shore. The author then adverted to the geographical distribution of the sea-pink in Germany, and represented the analyses as well calculated to throw light on the causes which contribute to chain some plants to a particular well-defined geognostic formation, by showing that a soil deficient in soluble silica and alkaline chlorides, of which the sea-pink requires a considerable quantity, is unable to sustain the life of that plaut. According to Schleiden, the sea-pink is found everywhere upon the arid sand dunes of the northern coasts, and is universally distributed over the sandy plains of northern Germany. In middle and southern Germany it is found only in a few places, and these are distinguished by their arid sandy character; and curiously enough, we find that the *Armeria maritima* disdains the richest soils

in the range of geographical distribution. Thus, we find in no Germany the granite, clay-slate, and gypsum of the Hartz mou and the porphyry and muschelchalk of Thuringia, setting a lin the *Armeria maritima;* and we meet with it only until we arri the Keupersand plains in the neighbourhood of Nüremberg. southern Germany it is found extending through the palatinate, neither on the Suabian Alps, nor the whole Alpine region, is it s and it appears at last again on the sandy plains of northern I The fact that the sea-pink is not found in every sandy soil in Germ suggests the idea that those inland localities where it occurs h been, perhaps, the bottoms of ancient lakes, and that the soil in th places contains much salt. In England and Scotland, the sea-pink found universally on the sea-coast; but, with a few exceptions, we not meet with it in inland situations. A remarkable exception to t general rule of its geographical distribution in England is offered the appearance of *Armeria maritima* on the summits of several mou tains of the Scottish Highlands.

NEW MODE OF PREPARING SULPHURIC ACID.

M. C. Blondeau states, that on examining the natural process which gives rise to the large quantities of Sulphuric Acid, occurring not only combined with bases, but also uncombined, he was induced to examine whether, under similar conditions, sulphuric acid might not be immediately produced from sulphurous acid gas.

For this purpose, some argillaceous sand was put into a porcelain tube, one of the ends of which communicated with two vessels, from one of which sulphurous acid, and from the other vapour of water, was disengaged; and at the same time air was passed into the interior of the apparatus by means of a gasometer. At the other end of the porcelain tube, a bent tube was immersed in water in a two-necked bottle, to one of which was fixed a disengaging tube. The apparatus being thus arranged, the porcelain tube was surrounded with burning charcoal, so as to heat it to dull redness; the sulphurous acid gas, air, and the vapour of water, were slowly passed into it. The substance disengaged at the end of the tube was sulphuric acid; taking care to supply an excess of air, but very little sulphurous acid was disengaged, the whole of it being converted into sulphuric acid.

To go from this laboratory experiment to a manufacturing case, sulphurous acid must be produced by the combination of sulphur or sulphurets, and the products of the combustion passed into a cylinder of cast-iron strongly heated, and containing argillaceous sand, passing into it at the same time excess of the vapour of water. The sulphuric acid will be received at the other end of the cylinder. The author is f opinion that no doubt can be entertained of the superiority of this lan to that which is at present adopted; and that by employing an pparatus thus constructed, sulphuric acid will be procured at a lower ice than is at present the case.—*Comptes Rendus; Philosophical gazine,* No. 238.

In the *Athenæum*, No. 1112, occurs the following notice of an experiment analogous to the above, by Professor Davy.

It has been generally supposed that the elements of sulphuric acid (oil of vitriol) will not combine in a direct manner, and that the presence of water is necessary to insure its formation. Professor Davy has lately shown that this is an error; and by the following experiment, made before the Royal Dublin Society, he demonstrates the practicability of forming sulphuric acid directly from its elements. Having placed in a dry Florence flask some sulphur, he vaporizes it by the application of heat, and then ignites the vapour by the introduction of a red-hot iron rod. The combustion extends throughout the vessel; and at the instant of its taking place, both sulphuric and sulphurous acids are formed—the former descending in condensed drops, and the latter escaping from the flask. Professor Davy hopes to render his process available to the manufacture of oil of vitriol.

PREPARATION OF PURE OXIDE OF COBALT.

M. Louyet's method is briefly this:—

To recapitulate: it follows that in order to purify oxide of cobalt, it is sufficient to dissolve it in dilute sulphuric acid, to evaporate to dryness, and calcine at a red heat, treating the mass with boiling water, and adding to the solution either hydrate of cobalt or carbonate of soda in the manner described. Sulphate of nickel appears to decompose more readily than sulphate of iron, under the circumstances described; when zaffre is treated according to M. Liebig's process, it yields oxide of cobalt quite free from nickel, but contains a large quantity of oxide of iron.—*L'Institut.* (See the paper entire in the *Philosophical Magazine*, No. 234.)

LIQUID PROTOXIDE OF NITROGEN.

M. Natterer, of Vienna, has constructed a forcing-pump for the Liquefaction of Gases, by means of which carbonic acid gas and protoxide of nitrogen can readily be obtained in the liquid state.

M. Dumas has employed one of these forcing pumps, more especially for Liquid Protoxide of Nitrogen, which furnishes a means of producing an excessively low temperature, and is very easily operated with. M. Dumas, in a paper on the subject, in the *Comptes Rendus*, first speaks of the reservoir of the apparatus, which he has had strengthened by surrounding it with a belt of iron, capable of resisting 800 atmospheres. This reservoir is also surrounded by ice, the body of the pump cooled uninterruptedly by a circulation of water around it, and even the stem of the piston was always moistened by cold water; in this manner there is no danger of the valve of the piston being injured by the heat proceeding from the compressed gas, and by its special action as a combustible gas. With these precautions, we may compress into the reservoir in the course of two hours 200 litres of gas, of which 20 suffice to produce a pressure of 30 atmospheres, about which liquefaction commences. The remainder of the *gas furnishes a liquid;* 100 litres yield 200 grms., or very nearly.

The gas should be absolutely dry in order to succeed, and likewise as pure as possible. M. Dumas prepares it from the nitrate of ammonia as usual, and after having dried it, passes it into Macintosh bags: a couple of pounds of nitrate of ammonia suffices.

Once compressed, the liquid gas may be preserved for one or two days at least in the reservoir; the valve, however, is slightly injured by it. When the stopcock of the reservoir is opened, the gas escapes; a portion freezes at first, but it then flows liquid; the solid portion resembles a mass of snow; it melts upon the hand, and rapidly evaporates, leaving a severe burn.

In order to observe more readily its properties, M. Dumas collected it in open tubes, contained in vessels at the bottom of which was placed some pumice-stone moistened with sulphuric acid. It then retains its transparency for a very long time.

The protoxide of nitrogen is liquid, colourless, very mobile and perfectly transparent; each drop that falls upon the skin produces a very painful burn. The gas, which is incessantly liberated by a slow ebullition, possesses all the properties of the protoxide of nitrogen. When metals are dropped into this liquid, they produce a noise like that of red-hot iron immersed in water. Quicksilver causes the same noise, instantly freezes, and affords a hard brittle mass, white like silver, which it perfectly resembles in appearance. Potassium floats upon the liquid, and experiences no change; the same is the case with charcoal, sulphur, phosphorus, and iodine. Ignited charcoal floats upon the surface of the liquid, and burns with considerable brilliancy, and frequently until the whole is consumed. Ordinary sulphuric acid and concentrated nitric acid freeze immediately. Æther and alcohol mix with the liquid without freezing. Water is instantly converted into ice; but it produces such a sudden evaporation of a portion of the liquid, that it causes suddenly a kind of explosion, which would be dangerous if merely a few grammes of water were poured at once into the liquid.—(Selected and abridged from the *Philosophical Magazine*, No. 227.)

PASSAGE OF HYDROGEN IN CURRENTS THROUGH SOLID BODIES.

M. Louyet has communicated to the Paris Academy of Sciences, the following singular results of some experimental researches in which he has been engaged, into the properties of Gases. If a current of hydrogen gas emanating from a capillary orifice be directed against a sheet of paper, held a few millimetres from the orifice, so that the current be perpendicular to it, the paper is traversed by the gas. But the gas does not percolate through, as might have been expected; it passes as a current, and may be inflamed behind the paper, as though nothing intervened between the gaseous current and the ignited matter; and farther, spongy platinum becomes incandescent behind the paper, in the path of the current, if the paper be three or four centimetres from the orifice; provided the metal is placed against the paper, or, at least, a very slight distance from it. The pressure under which the phenomenon is produced does not exceed from ten to twelve

centimetres of water. "To my great surprise," M. Louyet adds, "I have established that hydrogen gas traverses with equal facility gold leaf and beaten silver. Thus, surround spongy platinum with several folds of gold or silver leaf, and direct against it a current of hydrogen, the platinum will become incandescent, and the gold or silver will adhere to its surface. Behind leaf tin, also, spongy platinum is, in like manner, strongly heated. Through a thin membrane of gutta percha, such as is obtained by evaporating a slight layer of it from a solution in chloroform, hydrogen likewise passes: but hydrogen gas does not sensibly pass through pellicles of blown glass, however thin they may be."—*Mechanics' Magazine*, No. 1334.

PREPARATION OF NITROGEN GAS.

M. B. CORENWINDER has succeeded in obtaining, in a few minutes, a large quantity of this gas, in a state of absolute purity.

This process is derived from the decomposition of nitrite of ammonia, which, as is well known, is resolved by heat into nitrogen and water; but as this salt is difficult to prepare, it is replaced by a mixture of alkaline nitrite of potash and hydrochlorate of ammonia, a mixture which contains the elements of nitrite of ammonia and chloride of potassium.

In order to obtain the nitrate of potash in a proper state, it is requisite to employ a solution of caustic potash, of density 1·38, and to pass into it nitric oxide obtained from the decomposition of one part starch by ten parts of nitric acid, until a distinctly acid product is obtained; and afterwards to add to it caustic potash, so as to render it decidedly alkaline.

The nitrite thus prepared may be kept without undergoing alteration, so that a quantity of it may be insured: when nitrogen is required, it is sufficient to mix concentrated solutions of one volume with three volumes of hydrochlorate of ammonia, and to heat the mixture in a retort by a charcoal fire; the disengagement soon commences, and continues with perfect regularity.

As it is necessary, in order to have the gas pure, that the nitrite should be alkaline, it will be expected that a small quantity of ammonia will be evolved; but this disengagement is unattended with any inconvenience; if the nitrogen gas be required completely deprived of this alkali, it is sufficient to pass it through water accidulated with sulphuric acid contained in a bottle.

WHAT IS OZONE?

OZONE, to which influenza is ascribed by Schönbein, and cholera by others, has been variously described and defined. It is said, by some, to be a combination of nitrogen and oxygen; by others, of oxygen and hydrogen in new proportions. Dr. Spengler, of Elville, in *Henle's Zeitschrift*, declares it to be formed in the air by the decomposition of its water through disturbances of its electrical equilibrium. Dunglison, after Schönbein, defines it, "the powerfully odorous *matter produced* when a current of ordinary electricity passes

from pointed bodies into the air." Every one who has been in the habit of experimenting with a large electrical machine, must have marked this odour during the escape of positive electricity from point. Schönbein noticed, also, that it accompanies the electrolysis tion of water, that it is only disengaged at the positive electrode; that it can be preserved in well-closed glass vessels for any length time. (*Noad's Lectures.*) Draper, of New York, regards it as active state of oxygen, or oxygen rendered active by electricity. by passing a current of electric fluid through pure oxygen, ozone obtained, having a sulphurous odour, seiting fire to phosphorus irritating the nostrils, as in catarrh. The test of its presence is of paper dipped in a solution of iodide of potassium, and then in of starch. The oxygen of common air acts slowly on it, and produces gradual change and colouration. Ozone and ozonised air will occasion sion them to act promptly on each other, producing a dark colour. See *New York Journal of Medicine* for July, 1848; *Medical Times.*

ON CHLOROFORM.

MM. Soubeiran and Mialhe have contributed to the *Journal Pharmacie*, a paper on the Preparation of Chloroform. Towards close, "It results," say the authors, "from the preceding statement that as chloroform obtained from pyroxylic spirit cannot be entirely deprived of its pyrogenous odour, it ought not to be employed for haling. The presence of chlorinated oil, in the small quantity in which it exists in chloroform obtained with alcohol, has a strong marked influence in its employment: and to this must be attributed buted the uneasiness, nausea, and vomiting, occasioned by inhaling chloroform.

It follows that it is absolutely necessary to rectify chlorofor distillation, in order to separate the foreign body which it con and moreover the distillation should be stopped sufficiently soon

In concluding, the authors remark that chloroform, like hyd anic acid, when poured on filtering paper, partly evaporates so r as to occasion sufficient cold to solidify the remainder in white tufts, which remain for a few seconds.

The authors conclude from the facts above stated, that—

1st. Chloroform prepared from pyroxylic spirit is identica chloroform properly so called.

2nd. The purification of methylic chloroform is too diffic admit of its advantageous substitution for normal chloroform.

3rd. During the preparation of chloroform there is always pr a certain quantity of pyrogenous essential chlorinated oil, the ac which on the animal economy is extremely hurtful.

4th. It is indispensable to free chloroform from this chlo essential oil, by not continuing the rectification too long.—(S entire paper translated in the *Philosophical Magazine*, No. 23(

EFFECT OF CHLOROFORM ON THE SENSITIVE PLANT.

the *Year-book of Facts*, 1849, will be found an abstract of sor Marcet's* paper "On the Action of Chloroform on the ive Plant *(Mimosa pudica)*; upon which Professor Jameson ob-, in No. 92 of his valuable *Journal*:—

a Professor Simpson's interesting observations on Local Anæs-, we find the following notice, which we trust is but preliminary nore extended series of experiments on this subject, by Professor ar: 'Through the kindness of Professor Balfour I have had va- opportunities of trying the effects of chloroform vapour upon the ive plant *(Mimosa pudica.)* When the vapour was either too g or too long continued, the plant was destroyed. When it was ar and applied only for a few minutes, the leaflets in some plants l as when irritated, and did not expand again for an unusual h of time. In other plants under exposure to the chloroform ar, no closure of the leaflets took place, and, in a few minutes, lant became so anæsthetized, that the mechanical or other irrita- of the leaflets or stalk did not produce any of the common move-s, nor did their irritability become restored for a considerable afterwards.'"

COMBINED VAPOUR ENGINE.

HIS Engine, exhibited at Messrs. Horne's, in Whitechapel, is ked under the combined influence of steam and chloroform. It is easy to render mechanical details familiar without the aid of dia-ms; but the principles of the engine may be rendered intelligible a brief general description. The steam having done its work of ving the piston in one cylinder, escapes into another, in which is a ntity of chloroform in small flat tubes. This substance volatilizes t very low temperature; it is thus converted into vapour of con-rable elastic force by the heat of the waste steam, and is in this e employed to work a second piston. We have, indeed, two en-s combined in action, one moved by steam, the other by chloro-n. The professed advantages are the saving of 50 per cent. in ; and as all the steam is rapidly condensed in the evaporation of chloroform, the same water is constantly returned to the boiler, which the necessity for using salt or impure water is avoided. The engine of this kind was constructed in 1846, in Paris, in which r was then employed, This engine is still working in a glass ma-ictory at Lyons—chloroform being substituted. A Parisian in-s us that M. Charles Beslay has, by order of the Minister of ine, constructed a very powerful engine of this description, which ronounced by a Commission to be perfectly efficient. A question ng been raised as to the effect of chloroform on the health of the rs, M. Quoy, Inspector-General of the medical branch of the ine services, has reported favourably. We learn, however, that English patentees propose to use a volatile fluid which is much expensive than chloroform, equally efficient, and less obnoxious. *ientific Gossip; Athenæum*, No. 1106.

* *Misprinted* "Mariet."

ANTIQUITY OF CHLOROFORM.

M. STANISLAUS JULIEN has discovered that the Chinese in the third century of our era were in possession of an anæsthetic agent which they employed in the same manner as we use Chloroform and ether for producing insensibility during surgical operations. A description of this was discovered by M. Julien in a work preserved in the Bibliothèque Nationale—called "Kou-kin-i-tong," or a "General Collection of Ancient and Modern Medicines'—which appears to have been published in the 16th century. In a biographical notice of Hoa-tho—who flourished under the dynasty of Wei, between the years 220 and 230 of our era—it is stated that *he gave to the sick a preparation of Chanvre (Ma-yo), who in a few moments became as insensible as one plunged in drunkenness or deprived of life*:—then, according to the case, he made incisions, amputations, and the like. After a certain number of days the patient found himself re-established without having experienced during the operation the slightest pain. It appears from the biography of Hân that this chanvre was prepared by boiling and distillation. There can be but little doubt that this anæsthetic agent of the Chinese was the Indian hemp *(Cannabis Indica)*, which is taken even now by the Arabs to produce an agreeable drunkenness.—*Athenæum*, No. 1117.

RATIONALE OF THE EXPLOSION CAUSING THE GREAT FIRE OF 1845, AT NEW YORK.

DR. HARE has published some inferences and facts, tending to explain the contradictory impressions which have existed respecting the competency of fused nitre to explode with water, or with aqueous, hydrogenous, and carbonaceous combustibles. This subject was treated of in reference to a series of detonations terminating in an explosion of tremendous force, by which, in July, 1845, the intensely ignited contents of a store in Broad Street, New York, were thrown over an extensive district, involving the destruction of about 200 houses, and property estimated at two millions of dollars. As far as the oaths of highly competent witnesses could avail, no gunpowder was present, so that the result could only be attributed to the reaction between an enormous quantity of nitre and combustible merchandize with which the store was promiscuously occupied. In all there were 300,000 lbs. of nitre in parcels of 180 lbs. (each secured by two bags, an additional bag having been put over that originally employed). About 30,000 lbs. were situated upon the first floor, 180,000 on the second floor, and 80,000 on the third floor.

The details will be found quoted from the *Franklin Journal*, in No. 228 of the *Philosophical Magazine*. We have only space for the conclusion:—"Instructed by the facts and considerations above stated, it is inferred that the explosions which contributed to extend the conflagration in New York, as above mentioned, arose from the reaction of the nitre with the combustible merchandize with which it *was surrounded*. It is presumed that as soon as the fire reached any *of the gunny bags* it must have run rapidly through the whole pile.

f the interstices necessarily existing between them, the hich they were imbued causing them to deflagrate. Much)eing thus brought to the temperature of fusion, it must)out the floor, reached the combustibles, and soon found ıe next story through the scuttles which were open. All ust have been rapidly destroyed by the consequent defla- exceeding in activity any ordinary combustion. Mean- itre being all liquefied and collected in the cellar in a state :ence, and the merchandize conglomerated by the fusion shell-lac, aided by the molasses, the weight, the liquidity, ture, must have produced all the conditions requisite to nations. The floors having been consumed, the store een equivalent to an enormous crucible of twenty feet by e bottom of which were nearly 300,000 lbs. of nitre, heated far above the temperature producible by any fur- o convert the reagents into nascent aëriform matter under f half a million of pounds. The intense reaction, however, ermit of durable contact. At each impact the whole mass een thrown up explosively, and hence the successive de- But the chemical reaction, the heat, and the height of the with their growth, and strengthening with their strength, ation was succeeded by the thundering report and stu- losion of which it has been an object to afford a satis- u.ation."

USES OF GUN COTTON.

ther uses to which Gun Cotton is to be applied, we now Count de Werdinsky has patented a locomotive engine e worked with entire freedom from explosion by igniting ns of this substance underneath the piston in its cylinder. dissolved in ether has for some time been very successfully an application to incised wounds. When washed over the ether rapidly evaporating leaves behind a film which s to air; and thus the wound, protected from atmospheric eals by the first intention. This curious compound is d successfully as a remedy for tooth-ache. The cavity being cleaned out, a little asbestos saturated with collo- s called—to which a little morphia is added—is placed in n becomes solid; and thus an excellent stopping and a)dyne are applied at the same time.

d that *Gun Cotton* was used, for the first time, in actual the siege of Moultan. The brilliance and breadth of the e guns fired by this new adaptation of science to the de- war, are described as of terrific intensity.

NATE OF LIME AS AN INGREDIENT OF SEA-WATER.

ERING," says Dr. Davy, in a communication to the Royal e manner in which cliffs consisting of limestone are worn

away by sea-water in situations not favourable to the disengagement of carbonic acid gas; and, on the other hand, the manner in which sand is consolidated and converted into sandstone in other situations favourable to the disengagement of this acid gas, and the deposition of carbonate of lime (the cementing principle) in consequence; the author has been induced to make trials of the water of the Ocean, in crossing the Atlantic, to endeavour to ascertain whether carbonate of lime is widely diffused through the ocean, or is an ingredient of sea-water at no great distance from land. The results of his experiments have been of a negative kind, seeming to show that carbonate of lime exists principally in seas, where its presence is most easily accounted for; and where in the economy of nature, it may be supposed, it is most useful." The author describes also some trials which he made on sea-water in relation to the sulphate of lime it contains, which he found to be variable in quantity in different situations. He suggests the propriety of having more extended inquiry made on this point, believing that the results may be important in connexion with steam navigation,—the injurious incrustation which is liable to form in boilers at sea being composed chiefly of this compound.

NEW METHOD OF DETERMINING THE ORGANIC MATTER IN WATER. BY PROFESSOR FORCHHAMMER.

THE test which Prof. Forchhammer applies is hypermanganesiate of potash or soda,—which he prepares in this way. He heats the hydrate of potash or soda with chlorate of potash and the peroxide of manganese, according to the method of Wöhler. After heating, the salt is thrown into water, and so much diluted muriatic acid is added that it assumes a bluish red colour; upon which carbonic acid gas is let through, until the colour has become bright red, and the manganesiate of potash completely converted into hypermanganesiate. The liquid must be cleared, either by allowing it to deposit all the oxide of manganese, or by filtering it through asbestos. This liquid may be kept for a very long time, unaltered in a glass vessel with a glass stopper. The next process is to ascertain the strength of the test,—which is done by taking any determined measure of it, mixing it with water and a little alcohol, and then heating it. All the manganese is thrown down, and after being washed and exposed to a strong red heat, it is the compound oxide of manganese, 3 Mn + 4 O. This test is now applied in such a way that, for instance, one pound of the water which is to be tried is mixed with a small quantity of the test and boiled. If the colour has disappeared, another quantity is added, and the liquor again boiled, until, in going on in that way, the red colour of the liquid does not disappear any longer. After that, it is allowed to cool,—and then the quantity of hypermanganesiate of potash, which has not been decomposed for want of organic matter in the water, is determined by comparing its colour with distilled water: to which have been added very small determined quantities of the test solution. If the quantity of the test which is thus added in excess is subtracted from the whole quantity which has been used, the

quantity of decomposed hypermanganesic acid is determined, and thus also the quantity of organic matter itself. This method is liable to one fault,—viz. that the nature of the organic matter may be different, and accordingly require different quantities of the test liquor to be decomposed. But the organic matter which generally occurs in water is approaching almost always to humic acid, and thus the determination of the organic matter allows it to be compared. As to that part of the organic matter in water which contains nitrogen, the author thinks that he has found out a method for determining it by itself; but not having yet finished his experiments on that point, he must leave it out of the question. Water taken from a greensand spring about twelve miles from Copenhagen contained so little organic matter that one pound only required six measures of a test solution, of which 100 measures contained the manganese of 0.526 of the double oxide of manganese; while water taken from a lake which communicates with a peat moss required 1 lb. 74 measures of the same liquor. Prof. Forchhammer, continuing for a whole year every week this analysis of the water which is used for supplying Copenhagen, observed the following facts:—1st. The quantity of organic matter is greatest in summer. 2nd. It disappears for the most part as soon as the water freezes. 3rd. Its quantity is diminished by rain. 4th. Its quantity is diminished if the water has to run a long way in open channels.—*Athenæum*, No. 1143.

IMPURITY OF COMMERCIAL BROMINE.

M. Poselger, in distilling some samples of commercial bromine, found that the boiling-point was not 122° F., but 248° F.: and that the colour of the liquid became gradually lighter, till it was eventually quite colourless. On continuing the distillation to dryness, he obtained a residue of charcoal. On separating the bromine from the last portions of the distilled liquid by means of a solution of potash, an aromatic, oily, colourless liquid was obtained, which analysis proved to be carburet of bromine; this existed in various specimens of bromine to the extent of 6 or 8 per cent., and there is every reason to conclude that it was derived from the ether employed in the preparation of this substance.—*Journ. de Pharmacie et de Chimie.*

ANHYDROUS NITRIC ACID.

Anhydrous Nitric Acid, which had not hitherto been procured by chemists, has at length been prepared by M. Deville of Besançon by acting upon perfectly dry nitrate of silver with very dry chlorine gas. The anhydrous nitric acid is presented in the form of colourless crystals of great brightness and clearness, having the form of six-sided prisms. A communication on this subject from M. Deville has been presented by M. Dumas to the Paris Academy of Sciences.—*Athenæum*, No. 1117.

NEW AMIDES.

M. Ossian Henry has communicated to the Paris Academy of *Sciences*, a paper upon the existence of two new bodies belonging to

the *amide* series—one a limpid yellowish oil lighter than water, and disengaging a strong and penetrating odour, which the discoverer considers a *bi-sulphuret of amidogen*—the other a delicate yellow oil which when burnt gives out an alliaceous smell combined with a citron-like odour, which M. Ossian Henry regards as a *sulpho-cyanuret of amidogen*.—*Athenæum*, No. 1110.

ASPARAGINE.

M. DUMAS has communicated to the Paris Academy of Sciences, an important paper by M. Dessaignes on Asparagine, which he finds existing in the young shoots of the plants that compose the numerous family of Leguminaceæ. He appears to suppose it to be the legumine which is in the act of germination metamorphosed into asparagine.—*Athenæum*, No. 1110.

GOLD IN THE DEPARTMENT OF THE RHONE.

MM. ALLAIN AND BARTENBACH state that the copper mines of Chessy and of Saint Bel (Rhône) have been the objects of interesting experiments; the result of which is, not only that the copper and zinc which the pyrites contains may be easily extracted, but that it contains also at least 1-10,000 of gold. According to analyses, the numerical results of which are not stated by the authors, the pyrites contains sulphur, iron, zinc (about 8 per cent.), copper (about 5 per cent.), silica, arsenic, and gold, 1-10,000 at least. Although the experiments were not entirely finished, the authors considered that the separation of this small quantity of gold is easy and economical, and that the copper, zinc, and sulphuric acid obtained would partly cover the expenses of extraction. The method is briefly as follows:—The sulphur and arsenic being expelled by roasting, and the oxides of zinc and copper formed dissolved by sulphuric acid, the residue, which is composed of silica, sesquioxide of iron and gold, is to be washed, and then treated with a cold aqueous solution of chlorine; after some hours' action a solution of chlorine of gold is obtained, from which the metal is reduced by the usual processes; the chlorine in this case does not act upon the sesquioxide of iron.—*L'Institut*.

SMELTING COPPER.

MR. PENNY has patented a precess for Smelting the Carbonates and Oxides of Copper. As all the ores which we receive from South Australia, Chili, and Cuba (and last year 35,850 tons of these ores were sold at Swansea), are of this character, and require the use of particular fluxes to secure the formation of good malleable copper, it does appear to us important to ascertain if the simple process of Mr. Penny is as effective on a large, as we have reason to believe it to be on a small one. It consists in mixing with the ore when it is in a state of fusion, leaves chips, of wood, charcoal, or any carbonaceous body, which, undergoing combustion, rapidly removes the oxygen *from the ore*, and leaves the metal in a state of great purity.—*Athenæum*, No. 1112.

THE EXISTENCE OF MERCURY IN THE TYROL. BY M. H. ROSE.

M. WEIDENBUSCH, in analysing in the author's laboratory a spe-men of tender gray copper ore, stated to be from Schwarz in the rol, found it to contain a notable quantity of mercury, amounting to ·5 per cent. This gray copper is mixed with quartz and sulphuret copper. Its powder is almost black, and has a specific gravity of ·1075; when heated in a flask, it yields a little metallic mercury, ith a light reddish-brown sublimate. If it be mixed with carbonate f soda and heated, a larger quantity of mercury is obtained. It con-ins also zinc, iron, antimony, and sulphur, and traces of arsenic and ver. These substances exist in it in the same proportions as in her gray copper ores. A crytallized gray copper, also stated to be om Schwarz in the Tyrol, did not contain any mercury.—*L'Institut; hilosophical Magazine*, No. 229.

ANALYTICAL INVESTIGATIONS OF CAST-IRON.

MR. F. C. WRIGHTSON has communicated to the British Associa-n, series of analyses showing the influence of the hot blast in pro-cing the so-called "cold short iron," by occasioning an increased luction of phosphoric acid, and the consequent increase of phos-orus in the "hot blast" iron. The respective per-centages re—

	1	2	3	4	5	6	7
Cold Blast....	0·47	0·41	0·31	0·20	0·21	0·03	0·36
Hot Blast....	0·51	0·55	0·51	0·71	0·54	0.07	0·40

The irons differed also considerably as to the state in which the rbon was contained in the hard white iron, resembling impure steel, ntaining nearly all its carbon in a state of chemical combination; ilst the carbon contained in the grey and mottled varieties of iron s principally contained only as a mechanical mixture. The presence sodium and potassium in all the specimens examined was also no-ed for the first time; and it was thought probable that these might aterially affect the qualities of the metal.

COMPOSITION OF HONEY.

IT has been long known that the Honey of the Bee contains two fferent sugars, one of which is solid, and the other liquid. The for-er is considered as identical with the granular sugar, which is slowly posited from the syrup of raisin-sugar, or in that of cane-sugar altered acids. As to the liquid part of honey, it has been but little studied. . Biot has, however, stated that it is a sugar which turns the rays polarized light to the left.

M. Soubeiran has communicated to *L'Institut*, certain experiments, which he establishes the following facts:—Honey is composed of a xture of three different sugars; one is the granular sugar already own; *another is the liquid* sugar, which resembles in many parti-ars *cane-sugar altered* by acids, but is distinguished from it in pos-ng *a much stronger rotary* power towards the left. The absolute

rotary power of liquid sugar of honey at the temperature of 55° Fa., for the red ray, and at the length of 100 millims., is found to be equal—33·103 towards the left; whilst that of altered sugar, under similar circumstances, is found to be equal only to —18·933. The liquid sugar of honey retains its rotary power towards the left, even after it has been rendered solid; it is one of the few substances which possess this character. The third sugar which constitutes part of honey is distinguished from granular sugar in being unalterable by acids, and from liquid sugar in rotating towards the right. Its proportion is considerable in honey from the comb, diminishes by keeping, and even entirely ceases to exist in solidified honey.

SUGAR REFINING.

A PAPER has been read to the British Association, "On the combined use of the Basic Acetates of Lead and Sulphurous Acid, in the Colonial Manufacture, and the Refining of Sugar:" by Dr. Scoffern. Dr. Scoffern states the actual amount of pure white and crystallizable sugar existing in the sugar-cane juice to be from 17 to 23 per cent., and the amount of juice contained in the cane to be about 90 per cent.; of this amount only 60 per cent., on the average, is extracted; and of this quantity only one-third part of its sugar is obtained, in a dark impure condition, instead of white and pure, as it might be extracted. The operation at present generally followed in the colonial production of sugar involves the use of lime—an agent which although beneficial in separating certain impurities, and decomposing others, effects both these agencies at the expense of two-thirds of the original sugar. Curious plans have been followed to avoid the use of lime; alumina, in its hydrated condition, has been employed, but with inconsiderable success. As a purifying agent, the basic acetate of lead is known to be most potent, but cannot be generally employed, owing to the existence of no sufficient means of separating any excess of that agent which might remain. Dr. Scoffern effects this separation by means of sulphurous acid forced by mechanical means into the sugar solutions. The process had been used for more than twelve months in one of the large British refineries, and a lump of sugar prepared by means of the operation was exhibited. The advantages presented by this operation were thus summed up:—1. As applied to cane-juice, and other natural juices containing sugar, it enables the whole of the latter to be extracted, instead of one-third, as is now the case; and in the condition of perfect whiteness, if desired, without the employment of animal charcoal. Owing to the complete separation of impurities, the juice throws up no scum when boiled, and therefore involves no labour of skimming, Finally, the process of curing is effected in less than one-third of the present time; and the quality of the sugar being in all cases so pure and dry, no loss in weight occurs during the voyage home. 2. As applied to the refinery operation, it enables the manufacturer to work upon staples of such impurity that he could not use them on the old process. It yields from these staples a produce equal in quality to the best refined sugar

produced heretofore—in larger quantity, and in less time. It banishes the operation of scum-pressing, and the employment of blood and lime. Finally, its cost is even less than that of the present refinery process.—*Athenæum*, No. 1142.

THE ALEUROMETER.

M. BOLAND, a baker, of Paris, has invented an ingenious instrument, called by him the Aleurometer—the purpose of which is to indicate the panifiable properties of wheat flour. The indication depends upon the expansion of the gluten contained in a given quantity of flour—say 500 grains—when freed by elutriation from its starch. A ball of gluten being placed in a cylinder to which a piston is fitted, the apparatus is exposed to a temperature of 150 degrees; as the gluten dilates, its degree of dilatation is marked by the piston rod. If 25 degrees of dilatation are not obtained, the flour is rejected; the best flour usually giving from 38 to 50 degrees. From experiments which have been made by Chevreul and Payen, it appears that the dilatation shows correctly the degree of deterioration which the wheat flour has undergone; and consequently the Aleurometer offers itself as an instrument of practical importance. The same principle may be applied to various other purposes: indeed, Silberman has constructed a new alcoholmeter, of a character similar to the Aleurometer.—*Athenæum*, No. 1112.

CHEMICAL NATURE OF THE EGG.

M. BARRESWIL has presented to the Paris Academy of Sciences, a memoir stating that he has found sugar in the albumen of the Egg, and that the albumen is alkaline owing to the presence of carbonate of soda. He finds also that the yolk contains little or no alkali, and that its emulsive property is derived from a product resembling the pancreatic juice, which is not acid, and becomes so only by undergoing alteration. He further states that the acid reaction and properties of the gastric juice are owing to organic acid, and not to hydrochloric acid.—*L'Institut.*

SPONTANEOUS EVOLUTION OF COAL GAS.

MR. S. E. HOWARD has described to the British Association, a continued Spontaneous Evolution of Gas, at Charlemont in Staffordshire; where a hole being dug in the earth, and a gas-pipe inserted, on applying a light to its mouth, a large flame issued from it. Mr. Howard next, at 150 yards distance from the above spot, drove a pipe some inches into the ground under the floor of his cottage, and thus procured a continuous flow of gas; supplying seven burners in the dwelling, which enabled the owners to dispense with fire and candles. The next cottage is also supplied with two. It appears to make no difference to the supply of gas if allowed to burn for weeks together, and the flame is always of the same colour. In windy weather the flame is generally unsteady; when there is a blast of wind outside, the flames of gas rise several inches, but as each blast dies away, they return to

their original size. The escape of gas is larger in wet w
dry; but whether the gas is produced near the surface
has not yet been satisfactorily ascertained. The place v
from the earth is quite a mile from any coal-pit, and i
eastern edge of the Staffordshire coal-basin. The gas, as
composed principally of light carburetted hydrogen. In
of the gas as it rises were procured 996 volumes of lig
hydrogen, 3 of carbonic acid, and 1 of aqueous vapour
Its specific gravity is ·56126. Its composition is som
from the gas known as marsh gas, and from that which co
workings of mines, as it contains less carbonic acid, and
the proportions in marsh gas of the former being 1-20
latter, 1-15th to 1-20th. It burns with a pale blueis
emitting considerable light and heat. Mixed with atm
oxygen it explodes with considerable violence on contac
with the electric spark. As it issues from the pipe, it
slightly musty smell, as of sticks partially decompos
keeping for some time in stopped glass jars, this is lost,
perfectly inodorous. When inhaled in large quantiti
the same effects as hydrogen gas; but it does not appe
evil influence on the health of the inhabitants of the
diluted with a large portion of atmospheric air.

Mr. Blackwell, of Dudley, has shown that a series
verged to the area of this singular evolution of gas, and
probably it was through these that this carburetted hyd
charged from the extensive carboniferous deposits of t
hood.

PEAT BOGS OF IRELAND.

PUBLIC attention has been excited by a very extra
ment made in the House of Commons, by the O'Gorma
supported by Lord Ashley, asserting the 20,000,000 a
Ireland to contain substances of great economic val
duced at comparatively small cost. For this purpose,
upon the authority of one Mr. Owen, stated as follows:

"The extraction of 100 tons of peat in Ireland would cost
of chemically converting it would cost about £8 more; a
would be the following substances:—Carbonate of ammonia
£32 10s. 2d.; soda, 2118 lb., value £8 16s. 6d.; vinegar, 60
10s.; napthha, 30 gallons, £7 10s.; candles, that was, the
candles were constructed—600 lb., value £17 10s; camphi
value £5; common oil, 800 lb., value £3 6s. 8d.; gas to the va
ashes to the value of £1 13s.; total value, £91 16s. 8d. It
from this calculation, that for £16 expended in raw material
take a wide margin, and say, £20, a return of more than £
alised. And these were not mere theoretical results. Mr. Ow
operated upon hundreds and hundreds of tons of peat, and I
stake his character and his fortune upon the accuracy of hi
And the advantage was not confined to the extraction of the
question from the peat. When the superincumbent layer of
was cleared away, the soil beneath was found to be fruitful
pression, having been for ages absolutely saturated with amm

The publication of this remarkable statement was ra
by a letter in the *Times*, from Mr. Henry Seaman,

asserting that he and his neighbours lost £20,000 in an attempt to turn the peat of the bogs of Dartmoor to profitable account, in the same manner as the peat of Ireland has been treated by Mr. Owen and his partner. This letter was again followed by one from Mr. Robert Oxland, a practical chemist, residing at Plymouth, who rather confirmed the principal parts of the statement made by Lord Ashley.

We find the entire question thus strikingly dealt with in the *Illustrated London News*, No. 384.

"One-seventh of the total area of Ireland is bog land. Of these bogs 1,576,000 acres are flat bog, extending along the plains; and 1,254,000 are mountain bog, distributed principally over the hilly country. These bogs vary considerably in depth, some being not more than five feet, while others extend to forty feet. If, therefore, we assume, which is near the truth, that the bogs of Ireland have an average depth of twenty feet, we shall find that we have at least the enormous mass of 273,944,000,000 cubic yards of peat bog in that country available to some industrial purpose.

"Mr. Owen informs Lord Ashley that the extraction of 100 tons of peat would cost £8; observe the value of that statement. Sir Robert Kane, in his 'Industrial Resources of Ireland,' informs us, that a cubic yard of good turf, raised in close sods, weighs about 900 lb.; therefore, 100 tons will be found to consist of nearly 250 cubic yards; and the same authority assures us—and this is corroborated by the "Report of the Bog Commissioners"—that turf consumed in the immediate neighbourhood of the bogs costs 3s. 6d. per ton; but Sir Robert Kane prefers stating it at 4s. per ton generally. Even at 3s. 6d. per ton, the cost of 100 tons will be £17 10s. Even Mr. Oxland states that the Dartmoor peat cannot be raised for less than 2s. 6d. per ton; which we believe to be very far below the cost per ton of any raised by the company who lately abandoned their works in that district. But this 100 tons of peat contains about a fourth of its weight of water; therefore, 125 tons must be raised to produce 100 tons for the manufactory; the cost of which will, therefore, be £21 18s. instead of £8—no small difference in a business transaction. 'The labour,' says Lord Ashley, 'of chemically converting the peat will cost about £8 more.' Mr. Robert Oxland was well acquainted with the manufactory at Dartmoor, and he states that for 100 tons of peat in the retorts, 100 tons of peat must be burnt in the furnaces. This is another £21 18s.; so that, instead of the allowance made by his Lordship, taking, as he said, 'a wide margin' of £20, we find the materials produced actually must cost £43 16s.; and to this must be added men's wages in the manufactory, the cost of very expensive apparatus; and, even then, we have only produced an impure mixture, containing certain valuable compounds, which can only be separated by nice chemical operations. The materials produced, as enumerated above, are estimated as worth £90, and, no doubt, a fair marketable value is taken for the several items; but we believe, and we express this most conscientiously, that the cost of production would exceed their commercial worth.

"As the substances said to be produced are explicity stated, we are also enabled to test their value. Sir Robert Kane, than whom a more careful analytical chemist does not exist, gives the following analyses of two varieties of dense turf:—

	Kilbaha.	Cappoge.
Volatile Matter	72·80	70·10
Pure Charcoal	19·14	23·66
Ashes	8·06	6·24

"The ultimate analyses of the same turfs show its actual composition to be:

	Kilbaha.	Cappoge.
Carbon	51·13	51·05
Hydrogen	6·33	6·85
Oxygen	34·48	39·55
Ashes	8·06	2·55
	100.00	100.00

"From these elements, by re-combination, may be formed vinegar, naphtha, paraphine, the composition for the candles, &c., but certainly neither carbonate of ammonia nor soda. 'Turf,' says Sir Robert Kane, 'contains much less nitrogen than coal. Hence the liquor obtained in distilling turf *contains no free ammonia.*' And yet Lord Ashley assures us that for ages the soil has been absolutely saturated with free ammonia. We think those who are desirous of investing capital will place more reliance on the Irish chemist than the hon. member. Again, Sir Robert Kane tells us that the quantity of vinegar is so much less than that obtained from wood, that it cannot become an object of manufacture. The soda said to be produced is, as is shown by Mr. Oxland, added to aid in the formation of such carbonate of ammonia as they may obtain. Mr. Oxland gives the value of the sulphate of ammonia from one hundred tons of peat as £5 12s. 6d., instead of the £32 10s. stated by Lord Ashley. The gas cannot be employed on the spot, and it is therefore valueless, and the use of the ashes is exceedingly problematical; the account is therefore reduced, when we abstract the excess of ammonia, the soda which is not produced, and the gas and ashes which cannot be made available, from £90 to £63 10s., to produce which, be it remembered, the raw material costs £43 16s.

"We have faithfully examined the facts as they stand, and we are convinced that somewhere the grossest deception has been practised. Instead of *working* upon hundreds and hundreds of tons of peat, Mr. Owen confesses to having *experimented* only upon comparatively few tons; and, without any fear of contradiction, we boldly declare that it is utterly impossible to produce, by any process of manufacture, anything like the quantities of any of the materials named, except the charcoal and the gas, from one hundred tons of Irish peat."

DEODORIZING POWER OF PEAT CHARCOAL.

AT a meeting of the Botanical Society of London, Mr. J. W. Rogers has submitted the purport of his paper read at a previous meeting of the Society, "On the Uses and Properties of the Peat Moss, and the value of Peat Charcoal as a disinfecter and fertilizer." By the aid of peat charcoal, Mr. Rogers purposes to consolidate and deodorize the solid matter of the London sewers; and, whilst by that means benefitting the inhabitants of the metropolis, there would be placed within the reach of the agriculturist a manure of the most powerful kind, pulverized, free from odour, and fit for transit by any conveyance. In 1845, he brought the subject under the consideration of the public, and it was then alleged that charcoal could not give that quantity of carbon to the leaf of the plant which it was necessary it should receive; and that the leaf, and not the root, being the portion of it which required such sustenance, his discovery was of no use. Often, however, since then he had made the experiment, and the result had invariably been that it was the root, and not the leaf of the plant, which attracted the carbon; therefore, he was more convinced of the propriety of the system he was endeavouring to promulgate. From the experiments he had made, he had found that peat charcoal possessed far superior advantages over wood charcoal.

INFLUENCE OF BORACIC ACID ON VITRIFICATION.

M. MAES, manufacturer of flint glass, has, conjointly with M. Clemandot, long paid attention to the above-named subject. The principal results hitherto obtained are—1st. Borosilicate of potash and

...; 2ndly, Borosilicate of potash and zinc; 3rdly, Borosilicate of potash and barytes; 4thly, Borosilicate of soda and zinc.

The borosilicate of potash and lime was formed with the intention of producing in close vessels with coal furnaces the best imitations of Bohemian glass. In the *Compte Rendus de l'Exposition Autrichienne*, 1845, published by M. Peligot, it appears, that in order to make the purest and most durable glass in Bohemia, they use with 100 parts of silica, 12 parts of unslaked lime, and only 28 parts of carbonate of potash. From this we must conclude that the glass is better, the less potash and the more lime, it contains.

The above proportions yield a glass which is infusible in the furnaces employed by M. Maes. The addition of a few hundredths of boracic acid is sufficient to occasion fusion; and the resulting product possesses all the limpidity, splendour, and hardness which can be desired.

This first experiment naturally suggested the advantage which might be derived from the solvent power of boracic acid, so as to introduce bases into glass which had not hitherto been employed; as borosilicate of potash and zinc, and that of potash and barytes. The borosilicate of potash and zinc appeared to impart all the qualities of a pure and durable glass. As to the borosilicate of potash and barytes, it was prepared from native carbonate of barytes, contaminated with sulphate of barytes, and a ferruginous gangue. If then it be less colourless than the zinc glass, the colour is certainly accidental; on again making it with pure carbonate, this imperfection would unquestionably disappear.

The beauty of borosilicate of potash and zinc leads to the comparative trial of borosilicate of soda and zinc: this, although inferior to the potash, incontestably excelled all the soda glasses compared with it.

To recapitulate: the borosilicates are chiefly remarkable for their transparency and hardness. They derive these important qualities from reducing considerably the potash and soda, which almost always are in excess in common glass; and every one knows that glass which is too alkaline, is cloudy, soft and hygrometric.

These observations, in the opinion of the author, warrant the conclusion, that boracic acid must before long contribute to the perfecfection of glass for optical purposes; and M. Maes proposes to prepare borosilicates of great density, with lead, bismuth, &c., besides barytes.—*Comptes Rendus; Philosophical Magazine*, No 238.

COLOURED GLASS.

A paper has been read to the Chemical Section of the British Association, entitled, "Inquiries on some Modifications in the Colouring of Glass by Metallic Oxides;" by M. G. Bontemps. In this communication some important practical points connected with the coloured ornamentation of glass and porcelain were brought forward. In the first place it was shown that all the colours of the prismatic spectrum might be given to glass by the use of the oxide of iron in varying proportions, and by the agency of different degrees of heat; the conclu-

sion of the author being that all the colours are produced in their natural disposition in proportion as you increase the temperature. Similar phenomena were observed with the oxide of manganese. Manganese is employed to give a pink or purple tint to glass, and also to neutralize the slight green given by iron and carbon to glass in its manufacture. If the glass coloured by manganese remains too long in the melting-pot or the annealing-kiln, the purple tint turns first to a light brownish red, then to yellow, and afterwards to green. White glass in which a small portion of manganese had been used is liable to become light yellow by exposure to luminous power. This oxide is also in certain window glass disposed to turn pink or purple under the action of the sun's rays. M. Bontemps has found that similar changes take place in the annealing oven. He has determined, by experiments made by him on polyzonal lenses for M. Fresnel, that light is the agent producing the change mentioned; and the author expresses a doubt whether any change in the oxidation of the metal will explain the photogenic effect. A series of chromatic changes of a similar character were observed with the oxides of copper; the colours being in like manner regulated by the heat to which the glass was exposed. It was found that silver, although with less intensity, exhibited the same phenomena; and gold, although usually employed for the purpose of imparting varieties of red, was found by varying degrees of heating at a high temperature, and recasting several times to give a great many tints, varying from blue to pink, red, opaque yellow, and green. Charcoal in excess in a mixture of silica-alkaline glass gives a yellow colour, which is not so bright as the yellow from silver,—and this yellow colour may be turned to a dark red by a second fire. The author is disposed to refer these chromatic changes to some modifications of the composing particles rather than to any chemical changes in the materials employed.

Mr. Faraday spoke on the importance in all our inquiries of associating physical and chemical science. In the beautiful facts brought forward by M. Bontemps, it appeared that many of the changes of colour mentioned are purely physical. The phenomenon of the change of manganese from white to pink in glass appeared to him inexplicable as a chemical effect. Mr. Dilke inquired upon what peculiarity depended the differences discovered to exist in the coloured glass of the windows of old churches, and that of modern manufacture. M. Bontemps stated that the observed differences were entirely due to age and imperfections in manufacture. Mr. Faraday remarked that any irregularities tended to produce the diffusion of the rays which permeate the glass; and that the opacity of ancient church windows was probably due to a superficial change of the external surface. M. Bontemps stated that the old glass was by repolishing rendered as transparent as any modern glass.—*Athenæum*, No. 1143.

PHOTOGRAPHY AND THE DAGUERREOTYPE.

MR. CLAUDET has communicated to the British Association, "Re-

ı the Theory of the Principal Phenomena of Photography in rréotype Process." The various subjects treated by M. re the following:—1st. What is the action of light on the ating? 2nd. How does the mercurial vapour produce the ype image? 3rd. Which are the particular rays of light t to the chemical surface the affinity for mercury? 4th. ie cause of the difference in achromatic lenses between the photogenic foci? Why do they constantly vary? 5th. he means of measuring the photogenic rays, and of finding cus at which they produce the image? Light produces two fects on the Daguerréotype plate capable of giving an image. surface is decomposed, and the silver is precipitated as a der; this action is very slow. By the other, the parts light receive an affinity for the mercurial vapour; and is deposited in white crystals. This action, which is the e Daguerréotype image, is 30000 times more rapid than that the decomposition of the surface. After having examined nena of these two actions, Mr. Clandet considers that it is to refer them to the same cause. Tha first is a chemical ion of the surface; the second is a mere new property imhe surface to attract the vapour of mercury, which is given articular rays, and withdrawn by some other rays. The igible rays produce the affinity for mercury, and the less reithdraw it. Mr. Claudet afterwards explained the principle ographometer, and several improvements he has lately made rument, by which he can compose upon the same plate a itensities in a geometrical progression, varying from 1 to when employing two plates at the same moment from 1 to by another modification of the instrument he can, by shutalf of every hole through which the light has affected the submitting this half to radiation through red, orange, or sses, study the modifications produced on the various of effect by their coloured or insulated radiation.

eriments to which Mr. Claudet refers are too long to be d here; and we shall conclude by alluding to the most imint of this paper,—which is, the question of the difference e visual and photogenic foci, and the constant variations they the influence of unknown causes; at all events, which he has le to ascertain. It is known that several years ago Mr. Claudet it to point out the difference between the two foci, and the r the operator to place exactly the plate at the point where enic focus is produced in order to have a correct Daguerréo-e. But the new important fact lately observed by Mr. fers to the constant variation between the proportionate these two foci. It appears that, according to some causes Claudet has not yet been able to discover, the two foci for the ice of an object are sometimes coinciding, and sometimes e from the other; and, what is is most remarkable is, that ce *varies according* to some properties of the lenses, in such

a manner, that when the two foci coincide in some lenses, they may be very much separated in the other.

Mr. Hunt made some remarks on the peculiar distinctions observed in the phenomena of luminous and chemical action, which led him to infer that they were different in all their phenomena, although associated in action. Dr. Miller stated that he had in pursuing this inquiry been led to observe that the dark bands of the spectrum were extended in a remarkable manner over the space usually regarded as the most actively chemical; and he hence inferred, seeing that the interruptions of chemical action on sensitive surfaces were coincident with the bands observed on turmeric paper, that the chemical action was due to the luminous principle,—that, indeed, there was no difference between the action of light and the principle which Mr. Hunt was disposed to regard as dissimilar to it. Mr. Hunt admitted the value of Prof. Miller's investigations; but he was at present disposed to regard the facts observed as proving merely that actinism and light obeyed the same laws of motion. Dr. Daubeny made a few remarks on the unfortunate character of the name adopted to distinguish this chemical principle of the sun's rays.

PHOTO-CHROMATIC IMAGE OF THE SOLAR SPECTRUM.

It was announced in 1848, that M. Edmond Becquerel had discovered a process by which he was enabled to make photographic copies of coloured objects with distinct impressions of the colours on the body so copied. The *Comptes Rendus* of the 12th of February, 1849, contains the report of MM. Biot, Chevreul, and Regnault, on M. Becquerel's memoir, entitled "On the Photo-chromatic Image of the Solar Spectrum." The prospect, however remote at present, of being able to copy Nature in all the truth of colour, gives great interest to every experiment which leads to an advance in this particular. The main features of the new process are the following:—The ordinary silver plate, well polished with English rouge or tripoli, is connected with the positive pole of a Bunsen's battery of two series, and then plunged into a large vessel containing 610 cubic inches of muriatic acid diluted with about an equal quantity of water. In the same fluid is placed a thin plate of platina, which communicates with the negative pole of the battery. This plate is brought very rapidly a short distance from and parallel to the other. Under these conditions the plate assumes successively the colours of thin films: at first a grey, then a yellow and violet tint, which passes soon to a blue and to a green, becomes afterwards a light grey, then rose coloured, then violet, and at last blue. The operation must be stopped as soon as a lilac tint appears; the plate withdrawn rapidly from the bath, plunged into distilled water, and being placed in an inclined position dried over a spirit lamp. The plates thus prepared may be preserved in the dark for a long time; and before they are used it is recommended to rub the surface with a little cotton, which renders it more brilliant, and the colours formed under the influence of the spectral rays more *lively*. In diffused light the surface of chloride of silver thus prepared

rey; but if we project upon it a very pure and concentrated spectrum it receives at different rates impressions from all luminous rays in their respective colours, at the same time lecided colours are obtained by the non-luminous rays below d beyond the violet. By warming the prepared plate some anges are produced; and if warmed on a stove to about 212° Becquerel states that the most perfect condition for imhe spectral colours is brought about. The time which the ld be exposed to the solar spectrum varies with its intensity: ery concentrated, in a few minutes a finely coloured impresained. The photo-chromatic images of M. Becquerel may ed for a considerable time in the dark; but as yet no means discovered by which they can be rendered permanent against ued action of light. Admiring the zeal with which M. Becquerel has pursued his researches on this curious subject, ot forget that Sir John Herschel has long since succeeded ig a coloured impression of the spectrum on paper prepared getable juice; and that Mr. R. Hunt got a similar result ride of silver. We may therefore reasonably hope that the pencil of the sun-beam will add the charm of colour to cal pictures which it produces.—*Athenæum*, No. 1117.

THE BAKERIAN LECTURE.

cember 21, the Bakerian Lecture was delivered before the iety, by Prof. Graham; the subject being "On the Diffuiquids;" an abstract of which is given in the *Athenæum*,

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S IMPROVEMENTS IN PREVENTING INCRUSTATIONS; AND PURIFYING WATER.

HN HORSLEY, Practical Chemist, of Ryde, Isle of Wight, ed a new method of preventing Incrustations in Boilers; for Purifying, Filtering, and otherwise rendering Water fit ble and other purposes.

noving incrustations, the Patentee first purifies the water to n the boilers, as well as where sea-water is employed for steam: for this purpose he uses the oxalate of potassa, and phosphate of soda; and the precipitate resulting from the nt of these substances forms an admirable fertiliser for wheat rain.

rate the calcareous matter, which is oftener found in water other substance, the Patentee decomposes the same by calaustic barytes, or baryta water; the baryta uniting with the carbonic and sulphuric acids of the salts of lime, decomprecipitates the same along with the lime, in the form of of lime, carbonate of barytes, and sulphate of barytes. osphate of soda is added to water containing lime, the phosd unites with the lime to form the insoluble precipitate of of lime. When silicate of potassa unites with lime to form ble silicate of lime, oxalic acid, or acid of sugar, and its

soluble alkaline salts, oxalate of soda, oxalate of ammon potassa, sesqui-oxalate, or binoxalate of potassa, any of stances unite with lime to form a precipitate of oxala caustic strontia, or strontia water: the Patentee prefers, h oxalate of potassa, when it is designed to extract the w lime.

The Patentee first correctly ascertains the character or " of the water, by treating it with an excess of oxalate of an oxalate of potassa, which fully precipitates the lime. For lon of this precipitate, when obtained and dried, an equal crystallized oxalic acid is used to purify the water.

As the recovery for further use of the chemical materials the process of purification is of considerable importance, as economy, after the water is purified, &c., the Patentee thus for the recovery thereof:—

The precipitate of oxalate of lime is treated with an excess of sulphuric acid, which decomposes the oxalate of lime; and, tion with water, the oxalic acid is taken up in solution, which filtered and evaporated, yields crystals of pure oxalic acid; or be done by means of double elective chemical affinity, by boili precipitate along with a solution of carbonate of potassa, filteri crystallizing, the produce being oxalate of potassa, insoluble cart of lime being left on the filter.

We select these leading details from the Patentee's specificat

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PHOTOGRAPHIC GLASS PLATES.

M. Blanquart-Evrard of Lille, who a few years since ap priated to himself the discovery of a Photographic process invo every minute detail of the well-known Calotype, has now, throug Regnault, communicated to the Academy of Sciences of Paris, a pr by which the difficulties connecting themselves with the use of appear to be removed by the use of plates of glass. The proc preparing these plates is in its general details as follows:—" large vessel the whites of several eggs are placed, and all the soli non-transparent portions carefully removed. Add fifteen drops saturated solution of the iodide of potassium. These are to be beaten together *en neige*, and then allowed to rest until the mi returns to a liquid state. A sheet of glass being well cleaned alcohol, the albumen is carefully spread over its surface and plac a slight inclination to dry. When dry, it should present a very form surface, and be perfectly free from cracks or holes. This of iodized albumen upon glass is next to be covered with the salt, and the formula of the Calotype is the one adopted. In pra it appears to be necessary to place the surface of the albumen in tact with the aceto-nitrate of silver solution in a large dish, and to plunge the plate immediately into water. When dry, these

* For further information, see Mr. Horsley's "Account of his Proc published for sixpence, at the Mining Journal office, 26, Fleet Street.

are in precisely the same state as the iodized papers, and are rendered sensitive with the gallo-nitrate of silver in the same mer. Pictures obtained in this manner are said to equal the finest types; and in copying them the irregularities of paper no longer fere with the delicacy of the positive pictures.—*Athenæum*, 1114.

he simplicity of the process on glass is one advantage; but the ection of the primary pictures thus obtained, and the great beauty he positive photographs copied from them, are what render the overy of the greatest value. The present movement in advance ngs to France:—we find that two applications for patents are e in England. It must, however, be remembered that in 1840 John Herschel published in the *Philosophical Transactions* (vol. , pages 11-13) a description of some processes by which he obned pictures with the camera on glass plates, and produced positive ies from them upon paper. They were of exceeding delicacy and utiful definition.

IMPROVED PHOTOGRAPHIC PAPER.

A COMMUNICATION has been read to the British Association, "On Improvement in the Preparation of Photographic Paper, for the rpose of automatic Registration, in which a long-continued action necessary," by C. Brooke. The preparation of the paper described ay be thus briefly stated:—The paper is washed over by a brush ith a solution of twelve grains of bromide of potassium, eight grains f iodide of potassium, and four grains of isinglass in one fluid ounce f distilled water, and dried quickly. When about to be used it is shed over by a brush with a solution of fifty grains of nitrate of lver to one fluid ounce of water, and placed on the cylinder of the gistering apparatus, on which it remains in action for twenty-four ours. When removed the impression is developed by brushing over warm solution of gallic acid, containing twenty grains in the fluid unce, to which a little strong acetic acid is added, and is then fixed ith a solution of hyposulphite of soda in the usual manner. The present improvement consists in rinsing the paper in water after the pplication of the solution of nitrate of silver, pressing out the superluous moisture in folds of blotting paper, and then adding a little ore of the solution of nitrate of silver to the surface of the paper. This is most conveniently effected by pouring a small quantity on the aper, and then pressing a glass rod or tube lightly over the paper, y which the solution is evenly distributed over the surface, and the ontact of organic matter avoided. The increased sensibility and improved cleanliness of the paper consequent on this addition to the rocess are presumed to depend on the removal by washing of the itrate of potash formed by the mutual decomposition of the salts on e surface of the paper.

Natural History.

ZOOLOGY.

NATURE OF LIMBS.

PROFESSOR OWEN has delivered, at the Royal Institution, a discourse, the chief object of which was to prove that throughout the vertebrate series the bones of the Limbs exhibit characters which belong to them in relation to a predetermined pattern, like the archetypal world in the Platonic philosophy. Comparing the bones of the fore-arm of the dugong, the bat, the mole, the horse, and man, Professor Owen remarked that, if we attended only to final causes, we should not look for the homology between them; but that, although the principle of final adaptation will not satisfy the conditions of this problem, it may be explained by assuming the existence of typical forms of created beings which may extend to other planets. Professor Owen's discourse is published.

THE NERVOUS SYSTEM.

THE annexed striking remarks on the functions of the Nervous System are contained in the late Professor Berzelius's treatise on Animal Chemistry:—

"It would lie quite beyond the bounds of my subject here to dwell on the intellectual functions, and the different points in the brain by which they seem to be developed, yet I think it necessary to shew by an example how far we still are from comprehending *how* the functions of the brain take place. We will dwell but a moment on one of them, memory. Those registers of objects and occurrences which are formed in the course of a man's life; those dark but still sufficiently distinct tablets, the results of recitals or of reading; those numberless words of many languages understood by the same individual; the systems of facts which belong to the entire circuit of many sciences, and are preserved in a single human brain always ready for use, prepared to exhibit themselves intuitively to the individual—where do they all lie in this narrow space, in this emulsive mass? What part has the matter (the water, the albumen, and the cerebral fat) in that sublime activity, which nevertheless does not exist without it, and which, through its least derangement, is altered or entirely lost? If we are naturally seized with a holy admiration while, following the the doctrines of astronomy, we contemplate the universe with all its worlds infinitely continued through unbounded space, so must the admiration not be less which the contemplation of that organ excites in us, through whose functions man has succeeded in comprehending that greatness, in calculating the laws which govern the motions of worlds, and, if I might so speak, in subjecting to himself the elements, and making the powers of nature his servants."—*Translated from the German Edition.*

WHAT BECOMES OF THE SKELETONS OF WILD ANIMALS AFTER DEATH?

'HE following interesting fact is related by the Count de Mont-
:r, in his Memoirs, published in Paris. "It is," says Professor
ıeson, in No. 93 of his *Journal*, "as far as we have found, per-
ly new, and the general observation, of which the fact is illustra-
(that of the extreme rarity of meeting with any instances of wild
nals dying of what is called a natural death), has been less at-
led to and investigated than almost any other that could be named;
ıgh it is one of singular interest, and of great importance as con-
ed with the study of natural history. The Count de Montlosier
, that his thoughts had long been occupied on the manner in
:h animals living in a natural state—hares, rabbits, and game of
inds—met their death, and what became of their remains; and he
repeatedly promised large rewards to gamekeepers and others,
would procure him any animal in that state, but had never been
to meet with one. He then adds, that on examining a lofty
:ed cavern in this neighbourhood, he discovered that it contained
st number of skeletons, which appeared to be those of hares or
its. They were extended on the ground, all placed in a nearly
ar manner, and showing at once that they could not have been
ght there by any beasts of prey, as the bones were all perfect,
even the cartilages were preserved; whilst on some of them were
ons of the hair and flesh not decayed."

DR. MORTON'S CRANIOLOGICAL COLLECTION.

R. SAMUEL J. MORTON, of Philadelphia, has, within sixteen years,
sited in the Academy of Natural Sciences, a series, embracing
ırds of 700 Human Crania, and an equal number of the inferior
ıals. The human skulls are derived from all the five great races,
:asian, Mongolian, Malay, American, and Negro, and from many
rent tribes and nations of each. A primary object with Dr.
ton being to compare the osteological conformation of our abori-
. tribes with each other, and also with the other races of men,
ıas accumulated upwards of 400 American crania, pertaining to
:s placed at the remotest geographical distances, and subjected to
ıst every vicissitude of climate and locality of which the continent
ds examples. The anatomical facts, considered in conjunction
every other species of evidence to which Dr. Morton had access,
him to regard all the American nations, excepting the Esqui-
x, as people of one great race or group. The collection also con-
ı the embalmed heads of upwards of 130 ancient Egyptians, taken
ı the tombs of Memphis, Thebes, Abidos, &c; enabling Dr.
ton to prove, he believes, incontestably, that the Egyptians had
ıational affiliation with the Negro race. Their cranial characte-
:s can be distinguished at a glance; and the two nations, who are
tantly represented side by side on the pictorial monuments of the
, are as different from each other as the White man and the Negro

of the present day; yet these contrasts look back to a p time little short of 5000 years from the present day.

The Negroid inhabitants are obviously a mixed race betw Egyptian and Negro (or rather negress), in which the features latter are in preponderance. Dr. Morton has a considerable n of their heads from the catacombs, especially of Thebes. Lasti assemblage contains a fine series of the more distant Caucasian na Circassians, Armenians, Arabs, Persians, and Hindoos, with a sm but characteristic group of Malays, Chinese, Polynesians, and tralians. Yet this large collection does not yet contain a s Esquimaux or Fuegian head! The extremes of this continent are represented.—*Selected and abridged from the Transactions of American Ethnological Society*, Vol. ii.

GHILANES.

M. E. Du Couret, who has been for some time engaged in t exploration of Central Africa, has communicated to the Paris Ac demy of Sciences, some curious particulars of a race of Ghilânes, wl posses the appendage of a tail about a decimètre in length. He de scribes a specimen which he saw of this species of man, having an ex terior prolongation of the vertebral column. His country was be yond Sennaar, and the number of his race estimated at about 30,000 or 40,000. They loved above all things human flesh; and after their battles with their neighbours, when they make prisoners, they immolate and eat them without distinction of age or sex—women and children, however, being preferred, because their flesh is more succulent. M. Du Couret made a drawing of this slave, which was submitted to the Academy.—*Abridged from the Athenæum*, No. 1141.

MIRACULOUS BLOOD SPOTS ON HUMAN FOOD.

Under the influence of certain circumstances, of which it is difficult, if not impossible, to form any precise idea, there have been found occasionally upon bread, and other food, spots of a vivid red colour, closely resembling drops of blood. In 1819, these red spots appeared at Padua, and its environs, when a farmer was frightened by seeing drops of blood sprinkled upon his porridge, made of the maize which grew in the neighbourhood of his village; and for many days llowing, he saw the like red spots appear on all his food—new bread, ;e, veal, fish, boiled and roast fowls.

A Commission was eventually named to investigate the nature and ises of the phenomenon. M. Sette, on examining under the miscope these miraculous red spots, discovered that they were formed nyriads of small bodies, which appeared to be *microscopic fungi*, to which he gave the name of *zoogalactina imetropha*. He suced in propagating these minute organic productions; and in a oir published at Venice in 1824, he gives a detailed history of

During the year 1848, the same phenomenon appeared at ·, and fixed the attention of Ehrenberg. This celebrated micro- ·r has closely studied these red spots, and he believes them to

be, not as M. Sette supposes, microscopic fungi, but animalculæ of inferior degree, a monad to which he has given the name of *Monas prodigiosa*, on account of their extreme smallness. These little beings appear as corpuscles, almost round, of one three-thousandth to one eight-thousandth of a line in length; transparent when separately examined, but in a mass of the colour of blood. M. Ehrenberg calculates, that in the space of a cubic inch there are from 46,656,000,000,000 to 884,836,000,000,000 of these monads.—*Medical Times*, No. 497.

ANIMALS OF THE NINEVEH SCULPTURES.

MR. A. WHITE has read to the Linnean Society, a paper on Animals of the Assyrian Monuments, discovered by Dr. Layard, and now deposited in the British Museum. Mr. White commenced by pointing out the representations of a fallow deer, very vividly and accurately given—the spotted body and palmated horns, with two frontal snags, marking the species. He made some remarks on the domesticated animals being created *so*. The beautiful drawing of the outline of the head of the fallow deer, and of a goat, with their distinctive peculiarities and artistic feeling and accuracy, he particularly dwelt on; as also on two groups of sheep and goats, most pictorially treated, especially in the upper compartment, where they are represented as being driven off to their pasture, after having been counted. This group, he said, would not be unworthy the examination of Edwin Landseer himself. A vulture, closely allied to *Gyps tenuirostris*, was also specially alluded to. He exhibited casts from the armlet and sword-scabbard of one of the kings, in which animals form the ornament; and showed how jewellers and modellers now should go to Nature, if they wished to please and improve the eye. He showed a wood-engraving, one of several drawn from ivories from Assyria in the same collection. Mr. White then referred to the lions with short manes figured in bas-relief on these monuments. He drew attention to the prickle or hook at the end of the tail, which was clearly shown in one of the examples in the first room of the British Museum. He entered at some length into what had been written, seen, and said on this subject. The very bushy tail of the lions on the obelisk brought home by Dr. Layard, he believed to be entirely the result of the rudeness of *the art* of that curious monument. He showed that there were traces on one or more of the sun-dried bricks of the foot-prints of what he believed to be some small digitigrade carnivorous animal; and he expatiated on the importance of such *ichnographical* marks to the palæontologist.

THE ZOOLOGICAL SOCIETY'S GARDENS, REGENT'S PARK.

A GREAT improvement has taken place in the aspect of the grounds—the building of several new houses for their tenants, the enlarging of others, the addition of new plots of land, the increase in the number of visitors, and the variety of new species of animals lately added to the collection;—all highly creditable to the parties having the management of the gardens, more especially to the Secretary, Mr. D. W. Mitchell.

In the first place, with regard to animals:—it appears that in 1840 the collection numbered little more than 800 specimens; at the present moment (June, 1847) it contains considerably above 1,300, and very few of these are duplicates. Of these, 149 species belong to the Mammalia alone. From May 1847 to May 1848, sixty-three species of animals which had never been exhibited alive in the gardens before were added to the collection. Those which have bred since the spring of 1847 are thirty in number; and include the giraffe, the bison, the Wapiti deer, the capercailzie, and the eider.

Amongst the additions to the buildings in the Gardens, we may mention the new pheasantry, and the large inclosure for the Aurochs. A Carnivora building adjoining the Museum has been converted into a house for Reptiles, the plan of exhibiting which is very superior to any that we had seen previously adopted. Instead of inclosing the creatures in a dark box, in the bottom of which they can scarcely be seen curled up, they are placed in large glass cases in which all th movements can be watched. Branches of trees are introduced i the cases, in order that the animals may indulge in their arbo habits. Amongst the snakes in the collection are the following The Python Sebæ, the Fetish Snake of Africa, where it is worship by the natives. This specimen weighs 70 lb. Two other specie *Python*—the *P. molurus*, from the East Indies, and *P. Dussum* from Ceylon. A fine specimen of the Rattle Snake (*Crotalus ho dus*), with a young one, born since its arrival in this country. cimens of the Puff Adder (*Vipera arietans*), the Aspic (*V. aspis*), other species of *Coluber* and *Crotalus*. Of the Lizard tribe there but few specimens. There is a case full of the beautiful G Lizard (*Lacerta viridis*), of the continent of Europe; and there specimen of the *Plestrodon Aldrovandi*, from Egypt. There is a case of Green Frogs. The Tree Frog of Europe will not fa interest those who have never before seen it. Although of a b green when exposed to light, these creatures become almost blac the dark; and the specimens in the Gardens have presented e possible shade between a dark brown and bright green, after b kept in a dark place.

A pair of Satin Bower Birds (*Ptilonorhynchus holosericeus*), been brought from Sydney, by Mr. Aspinwall: they have bui the new aviary one of those elaborate bowers, or breeding-pl which caused so much speculation when they were first discover the Australian bush.

At a meeting of the Zoological Society, on Feb. 20, the Secr informed the members of the Birth of a Giraffe, at the Menager the Regent's Park. The female camelopard, or giraffe (*Gir xerapha, serapha*, seraph, angel), is at the least sixteen feet lineal measurement.—*Selected from the Athenæum.*

THE CAMEL INTRODUCED INTO SOUTH AMERICA.

At a lecture given by M. Geoffrey Saint-Hilaire, on the natura tion of the Alpaca in France, the interesting fact that the little

ic of Bolivia imports annually a certain number of Camels, hoping nder them available as beasts of burden over districts where other nals failed, was mentioned by M. Weddell. This interchange of animals of the Old and the New Worlds must be of great interest he philosophical naturalist.

A NEW ANIMAL.

M. ANTOINE D'ABBADIE, writing to the *Athenæum*, from Cairo, es the following details of an animal new to European science, ich details he received from Baron Von Müller, who had recently rned to that city from Kordofan :—At Melpes, in Kordofan, the on bought an A'nasa, of the size of a small donkey, with a thick ly and thin bones, coarse hair, and tail like a boar. It has a long n on its forehead, and lets it hang when alone, but erects it immediately on seeing an enemy. It is a formidable weapon. The asa is found not far from Melpes, towards the S.S.W.

NEW HIPPOPOTAMUS.

R. S. G. MORTON, in the Proceedings of the Academy of Natural nces, at Philadelphia, for February 1844, described this new ies of Hippopotamus, there named *H. minor*. As this name was iously used by Cuvier for a fossil species, it is now changed to Hippotamus (Tetraprotodon) *Liberiensis*. This animal is slow and heavy motions, and weighs 400 to 700 pounds. It lives on the river St. 's, a stream that rises in the mountains of Guinea, and passing igh the Dey country and Liberia, empties into the Atlantic to orth of Cape Mesurado. The description of the animal by Dr. ton is drawn from two skulls in his possession, the only specimens h have hitherto been brought from the African coast.

CAPTURE OF A WHALE IN THE THAMES.

N October 9, a "Finner" Whale was taken fast ashore on the k Shelf, a shoal abreast of Grays, on the Essex bank of the nes. It was with much difficulty secured with ropes, dragged to , and there killed with a sword. This whale measured 58 feet in h, and 30 feet in girth.

THE DODO.

PAPER has been read to the British Association, "On additional es of the Long-legged Dodo, or Solitaire, recently brought from Mauritius," by Mr. H. E. Strickland. The author exhibited imens of bones, which were quite confirmatory of the views that he previously taken of the structure and relations of this family of s.

ne result of Mr. Strickland's researches for the last three years the affinities of the Dodo, is that the bird is not *gallinaceous*, but l to the *pigeons;* and this latter opinion the Prince of Canino netly confirmed at the above meeting.

r. Macdonald *objected to* the terminology used by Dr. Melville

and Mr. Strickland in their account of the structure of the anat of the dodo and its kindred. Dr. Grosshans stated that the D Government had given orders that search should be made in all museums for any remains of the dodo, or its kindred extinct spe (See papers on the History of the Dodo, by Mr. Strickland and Hamel, in the *Year-book of Facts*, 1848, p. 212 to 216.)

Mr. Strickland and Dr. Melville have lately published a beauti illustrated monograph on this bird,* in which the history and eco of the dodo are minutely investigated. A question of much int has arisen amongst zoologists as to what section of birds the belonged to. Mr. Vigors thought it was a gallinaceous bird alli the ostriches. M. de Blainville referred it to the order comprisin vultures and eagles—a view in which Mr. Gould agreed. Mr. Edward Gray thought the head and foot at Oxford belong different birds; the head to a vulture, the foot to a gigantic barn fowl. Prof. Owen, after a lengthened examination, adjudged it a vulture or raptorial bird. But to none of these families d really belong. Prof. Reinhardt first suggested that it might be a form of the Columbidæ—the pigeon family; and a pigeon it ap to be.

Mr. Strickland and Dr. Melville, in their Monograph, show three other species of birds inhabited the islands of Bourbo Rodriguez, and were sometimes described as dodos. One of found in Rodriguez, has been called the solitaire: and of this re exist in the museums of Europe. There is sufficient evidence structure of them all to lead to the conclusion that they were closely allied to the dodo, and that they became extinct at abo same time, and under the same circumstances, as that bird.

Mr. Brandt, at present engaged with an extensive memo aquatic birds, has had his attention drawn aside from that s by the receipt of interesting details regarding the Dodo, furnish him by Dr. Hamel and the Directors of the Museum of N History of Copenhagen. This remarkable bird, a former inha of the Mauritius, but extinct for two hundred years, is plac Mr. Brandt among the Grallæ; and he announces the discov certain osselets peculiar to the cranium of the grallæ, which furnished him with new characters for the classification of that so rich in species.—*Jameson's Journal*, No. 93.

LARGE SUN-FISH.

In October, the crew of Her Majesty's Surveying Ketch *S* while lying in Little Killery Bay, on the coast of Connemara, ca a large specimen of the Sun-Fish (*Orthagoriscus*). It had no skeleton, nor was there any osseous structure whatever, exce which stretched between the large fins. Its jaws, also, had

* *The Dodo* and its Kindred. By H. E. Strickland, M.A. and A. *ville, M.D.* Reeve and Co.

terminations, unbroken into teeth, and parrot-like, which, when not in use, were hidden by the envelopement of the gums. The form of the animal was preserved by an entire cartilaginous case, of about three inches in thickness, covered by a kind of shagreen skin, so amalgamated with the cartilage as not to be separated from it. This case was easily penetrable with a knife, and was of pearly whiteness, resembling cocoa-nut in appearance and texture. The interior cavity, containing the vital parts, terminated a little behind the large fins, where the cartilage was solid, to its tapered extremity, which was without a caudal fin. Within, and around the back part, lay the flesh, of a coarse fibrous texture, slightly salmon-coloured. The liver was such as to fill a common pail, and there was a large quantity of red blood. The dimensions were as under:—

Eye round, and like that of an ox, 2½ inches diameter. Gill-orifice, 4 by 2½ inches. Dorsal and anal fins equal, 2 ft. 2 in. long, by 1 ft. 3 in. wide. Pectoral fins, 10 in. high by 8 broad. Length of fish, 6 ft. Depth, from the extremities of the large fins, 7 ft. 4 in. Extreme breadth at the swelling under the eye, only 20 in. Weight, 6 cwt. 42 lb.

Two engravings of this extraordinary fish have appeared in the *Illustrated London News*, No. 392.

GYMNETRUS NORTHUMBRICUS.

In May last, there was exhibited at the Cosmorama Rooms in Regent Street, a preserved specimen of a species of Gymnetrus, recently caught at Cullercoats, on the Northumberland coast. This fish belongs to the family of Tæmidæ (ribbon-shaped), only a few of which are found in British seas. A specimen similar to the present was formerly taken at Elgin; and as the species is probably new, it has been called *G. Northumbricus*. The present specimen is about 13 feet in length, and has a flat body, with a small head and mouth. The dorsal fin extends from the head to the tail. On the crown of the head several of the rays are separated, lengthened, and enlarged, so as to form a kind of crest. This animal was seen floating on the water nearly dead; and, when opened, it was found to have swallowed a piece of zinc, which had evidently been the cause of its weak condition. These fish apparently live on the ground in the deep sea; and the smallness of their mouths, which does not permit of their taking ordinary bait, will account for their being so seldom seen. The above specimen was empirically associated with the sea-serpent.

THE OIL OF HERRINGS.

M. de Quatrefages has addressed a note to the Paris Academy of Sciences, on the extraction of the Oil of Herrings, and the preparation of *tangrum*, a manure which he considers fitted to form a substitute for guano.

The object of the note is to draw attention to some facts, too little known, *which seem to him* calculated to open up a branch of industry

long forgotten in France, and to enrich agriculture with an entirely new manure. These details are derived principally from the unpublished documents which M. Noel de la Moriniere, late General Inspector of Fisheries, had collected for a General History of Fishes among the Ancients and Moderns; but he died after publishing only the first volume. His papers, first submitted to Cuvier, passed into the hands of M. Valenciennes, who communicated them to M. de Quatrefages.

A very simple process is employed to extract the oil of herrings. The fish are boiled in fresh water for five or six hours, and constantly stirred. When the herrings are reduced to a pulp, the mass is allowed to cool; the oil swimming on the surface is then collected, and clarified by filtering, or simply by pouring it several times from one vessel into another, and it is then put in barrels. It thus appears that the expression to *burn herrings*, which is used to express this process, is far from giving an exact idea of it. M. de Quatrefages proposes to make use of it as a manure.—*Jameson's Journal*, No. 92.

ELECTRIC FISHES.

M. R. WAGNER has laid before the Academy of Sciences at Paris, an extract from his new researches on Electric Fishes.

Since his first investigation on this subject, the author has studied a greater number of electrical fishes, and has directed his attention particularly to their nervous system, more especially of the brain. He has endeavoured to determine anatomically whether there was in the general structure a certain central organ (a ganglionic mass) combined with the brain and spinal marrow, in which the nerves of the electric organ might originate, or whether the ganglionic substance necessary to this structure, instead of being apparent to the eye, may not be often merged in different parts of the interior of the brain or spinal marrow. He has endeavoured to ascertain, in the second place, whether, in the first general case, the original plan of the structure of the brain, which, among vertebrates, evidently presents the most simple form, undergoes any modification by the appearance of these accessory ganglions, or whether these organs are connected with the general plan; or whether they constitute an ulterior development of the already existing portions of the brain.

The author's observations refer to Torpilla, the Narcine, Gymnotus electricus, and the electrical Malapterus of the Nile; and it appears to result from them, both in a morphological and in a physiological point of view, that it is extremely doubtful whether the brain be the seat of a nervous centre for the electrical apparatus; he rather thinks that this centre exists either in the *medulla oblongata*, or in the spinal marrow.—*Jameson's Journal*, No. 92.

GEOGRAPHICAL DISTRIBUTION AND USES OF THE COMMON OYSTER.

THE *Ostrea edulis* may be said to have its capital in Britain; for though found elsewhere on the coasts of Europe both northward and

southward, in no part of them does it attain such perfection as in our seas, through which it is generally distributed, sparingly in some places, abundantly, and in gregarious assemblages, in others; chiefly inhabiting the laminarian and coralline zones.

In Bishop Spratt's "History of the Royal Society" is contained the first paper of importance on the Oyster Fisheries of England. This has long been the staple of articles in the several Encyclopædias. In the earlier volumes of the *Philosophical Transactions* are several notices on oysters, especially a short account of the spot by the celebrated Leuwenhoeck; and a letter from the Rev. Mr. Rowland to Dr. Derham, in which it is stated, that though the beds in the Menai furnished then (1720), as they do now, abundant oysters, twenty-four years previously none existed in the locality; they were originally laid down there by a private gentleman. These beds are now recruited from the Irish coast.

In Part XX. of Messrs. Forbes and Stanley's valuable History of British Mollusca will be found a complete account of the various British Oyster Fisheries, collected by the authors from the best and latest authorities, and containing much original information upon the subject.

M. de Quatrefages has recently ascertained that, contrary to the common opinion, the sexes are separate in the oysters M. Blanchard's observations confirm those of M. de Quatrefages. In his investigations into the Nervous System of Mollusca, he has had occasion to examine a great number of these animals, and in the proper season he always found the eggs and the spermatozoa isolated in different individuals.—*American Journal of Science and Arts*, No. 21.

THE GREAT SEA-SERPENT.

Mr. J. A. Herriman, commander of the ship *Brazilian*, states that on the 24th February, he was becalmed in lat. 26 S., lon. 8 E. (about forty miles from the place in which Capt. M'Quhae is said to have seen the Great Sea-Serpent); when he perceived something stretched along the water to the length of about 25 or 30 feet, and perceptibly moving from the ship with a steady sinuous motion. The head, which seemed to be lifted several feet above the waters, had something resembling a mane running down to the floating portion, and within about six feet of the tail it forked out into a sort of double fin. Having read at Colombo the account of the monster said to have been seen by Captain M'Quhae in nearly the same latitude, Mr. Herriman and the others on board were led to suppose that it must be the sea-serpent seen by Captain M'Quhae. Mr. Herriman had a boat lowered, and taking two hands on board, together with one of the passengers, they approached the object, when it proved to be an immense piece of sea-weed. evidently detached from a coral reef, and drifting with the current, which sets constantly to the westward in this latitude; and which, together with the swell left by the subsidence of the gale, gave it a sinuous snake-like motion. But for the opportunity of examining the weed afforded by the calm, Capt. Herriman admits that he should

have concluded the above to have been the Great Sea-Serpent. What appeared to be the head, crest, and mane of the *immense volumen*, was but the large root, which floated upwards, and to which several pieces of coral-reef still adhered. The captain had it hauled on board, but, as it began to decay, was compelled to throw it over.

LIVING IGUANA, IN THE ZOOLOGICAL SOCIETY'S GARDENS.

AMONG the most interesting tenants of the new Reptile House is a live specimen of the Iguana (*Cyclura colei*) obtained from Jamaica, and presented to the Society by Dr. Andrew Smith. In colour it is a greenish-grey; it is fond of lying lazily along an elevated branch, and its favourite food is ripe pears. Its serrated tail is a formidable weapon of defence, with which, when alarmed or attacked, it deals rapid blows from side to side. When unmolested, it is harmless and inoffensive, and appears to live in perfect harmony with the smaller species of lizards which inhabit the same division of the house.

This animal has been engraved in the *Illustrated London News*, No. 398.

THE KEELONG.

ASSISTANT-COMMISSARY-GENERAL ROBERT NEILL has illustrated to the Wernerian Natural History Society, the habits of the Keelong, or *Chelodina longicollis*, of New Holland; and exhibited a living specimen, brought by him from King George's Sound, and probably the only living one ever seen in Europe. It is an aquatic tortoise, inhabiting fresh-water lakes and marshes. From the nose to the tail it measures 1 foot 4 inches, the neck and head occupying about 6 inches. When it raises its head above the water, and its large oval shell is immersed, it so greatly resembles a poisonous black snake which inhabits the same localities, that even the natives are sometimes deceived and frightened. It feeds upon the spawn of frogs, young tadpoles, and chulgies, or small crayfish, which last are described as very abundant. The natives esteem the keelong very much as food; and Mr. Neill mentioned that he had boiled one, and found it to resemble in flavour a tender fowl. It is not seen during the winter months, from June till August; and Mr. Neill thinks that it remains torpid during that season, burying itself in the soft mud under the roots of reeds. About the beginning of February (the Australian midsummer), the keelong comes on shore during the night, makes a hollow in the sand, and lays from twelve to eighteen eggs, about the size of those of a pigeon, but more oblong. It covers up the eggs, and leaves them to be hatched by the heat of the sun; but the natives, knowing the surface-marks, collect great numbers of them for food; and Mr. Neill mentioned that he had tasted them when cooked at a native's fire in the woods, and found them delicate and good. During the journey from King George's Sound to Edinburgh, the keelong remained five months without food, was only twice dipped in water, and arrived much emaciated and very weak. It was now kept in a hothouse in Dr. Neill's gardens at Canonmills, and recovered vigour; its neck and limbs, which were shrivelled, having become full and

firm. It was fed every second or third day, and greedily gulped down some bits of raw butcher-meat, placed in its water-trough.—*Jameson's Journal*, No. 92.

SUPPOSED BORING POWERS OF THE ECHINUS LIVIDUS.

MR. W. C. TREVELYAN, having lately had an opportunity of inspecting *in situ* at Kilkee, on the coast of Clare (Ireland), the curious *Echinus lividus* of Lamarck, about whose Boring Powers much has been said and written, has, after many observations, come to the conclusion that the animal does not possess any power, chemical or mechanical, of boring into rocks. This Echinus instinctively seeks for the most sheltered situations, either in an angle between two rocks, or in depressions resulting from the disintegration of the rock, which, in limestone, are often very numerous and deep. Very young individuals Mr. Trevelyan has several times found comfortably ensconced in deserted limpet or other shells. The bottom and sides of the cavities occupied by the Echinus become in time smoothed and deepened, more particularly in limestone; but this, Mr. Trevelyan is convinced, is not the effect of instinctive action, chemical or mechanical, nor of the locomotion of any one individual, but of that of countless generations which have successively inhabited the spots during the lapse of ages; they have thus gradually worn the stone away, and produced the remarkable appearances as of regularly bored holes, the depth of which is in many cases increased by the growth of the common millepora around them.

SIREX.

MR. E. DOUBLEDAY has exhibited to the British Association, specimens of the larva, pupa, and a perfect insect of *Sirex gigas*, an insect mostly rare in Great Britain. These specimens were sent to Mr. Gray from Bath, by Mr. Brunel, and were accompanied by fragments of the wood on which the larva had fed: this consisted of larch-poles, from which proceeded thousands of individuals, chiefly females, of *Sirex gigas*. From the specimens exhibited, it would seem that the larva prefers the soft sap wood to the more solid internal part of the trees; penetrating this part longitudinally, at a little distance from the bark, the perfect insect gnawing its way through when ready to make its appearance. Mr. Doubleday remarked, that there was here ample evidence to disprove St. Fargeau's idea that this fine insect is a parasite upon some timber-boring beetle—an opinion already controverted by Mr. Westwood and others. The larva, pupa, and perfect insect are figured by Ratzeburg in his work on "Insects Injurious to Forests;" but he gives no details of the habits of the insect, nor any figures indicating the mode of life of the larva.

PREVENTION OF THE BED BUG (*Cimex lectularius*).

MR. THOMAS STRATTON, in reference to letters on the Prevention of the Bed Bug (*Cimex lectularius*), says:—"I have used Sir W. Burnett's *disinfecting* fluid, the solution of the chloride of zinc;

it was applied, by means of a feather, to all the joints and crevices in the bedstead, and with complete success. The solution entering the wood, rendered it an unfit, and probably a poisonous habitation for the *Cimex*."

The prevention of these animals is of more importance than some may at first suppose it to be. In some severe diseases, the disturbance they give the patient may greatly impede recovery; and instances have occurred of soldiers in barracks, finding sleep impossible in bed, have gone out of doors, and, sleeping there, have been seized with inflammation of the lungs, or other diseases, dangerous, and sometimes fatal.—*Annals of Natural History.*

THE COFFEE-BUG.

Lord Torrington, the Governor of Ceylon, states, in a letter to Earl Grey: so serious have the attacks of the Coffee-Bug (a species of *Coccus* or scale-insect, said to be allied to *C. Adonidum*) proved for the last few years to the coffee plantations, that the produce of one estate, which had in former years been 2000 cwt. of coffee, fell suddenly to 700 cwt., wholly from the destruction caused by the bug; and a similar heavy loss as to other coffee plantations is confirmed by Mr. Gardner, who speaks of the insect as not confining its ravages to these, but spreading to other trees and plants, as limes, guavas, myrtles, roses, &c., so that in the Ceylon Botanic Garden there is scarcely a tree not in some measure affected. It appears highly probable, from facts collected by Mr. Gardner, that this coffee-bug was introduced into Ceylon with some Mocha coffee-plants brought from Bombay; and it is equally probable, as Dr. Lindley suggests, that, had the foul plants been all burnt, or dipped in hot water, so as to kill the bugs, the Ceylon coffee planters might have been saved from their present painful position. But why were not these precautions taken? Simply because these coffee-planters were wholly ignorant of entomology.—*Address of the President of the Entomological Society, W. Spence, Esq.*

CULTIVATION OF SILK IN ENGLAND.

Mrs. Whitby, of Newlands, near Lymington, Hants, has communicated to the British Association, some further results* of her experiments; having paid much attention to the cultivation of the mulberry, especially of that species introduced in 1846, viz. the *Morus multicaulis* of the Philippine Islands. Three other kinds of white mulberry grow well at Newlands; but none are so easily propagated as the *multicaulis*, or bear so great a weight of leaf. The produce of leaf this year has been immense. The cuttings which are rooted in the open ground produce stronger and healthier plants than those struck under glass. One of Mrs. Whitby's early pupils has a productive nursery at Godalming of the *Morus alba*: many others in

* See the Report of Mrs. Whitby's previous Experiments, in the *Year-book of Facts*, 1847, page 231.

rent parts of England are planting; and if gentlemen in England Ireland who have a few acres or roods of land to spare, would t mulberries for posterity as they do their oaks, it is believed hould, in a few years, be independent of other countries for our ly of raw silk.

rs. Whitby finds the rearing of the silkworm easier every year; is confirmed in her belief, that with due attention to their pecu-ies, they may be reared in England as easily as in any other try, and with as little loss by death. Equable warmth through-he period of their existence (which may be shortened or prolonged easure), cleanliness, classification, and ventilation, with the adap-n of the food (as to its maturity) to the different ages of the t, will insure success. The silk of the past year is as strong, t, and beautiful as that which, in 1844 and 1845, was pronounced rior to the best Italian raw silk.

LUMINOSITY OF THE SEA.

R. C. W. PEACH has illustrated to the British Association, the Lu-sity of the Sea on the Cornish Coasts. The author described the of the weather at the time of observation, comparing it with that h occurred soon after,—as well as the animals observed on those ions. He exhibited drawings of many, some new to the British —one, at least, of which has been found in the Mediterranean. e were abundant in July, but were destroyed by a heavy gale of ; since which they have not been noticed. They belong to the ydiæ. The author had a long list, arranged in a tabular form, of animals, state of weather, date, and hour of observation, the unt of luminosity, &c.; but we confine ourselves to giving the list imals observed, with a table of the number of observations made re years, and the changes of weather that took place soon after:—

Very Luminous.

	n the weather has changed suddenly from fine to wet, gales of wind, and at times tempestuous, with lightning, &c.	When it continued Fine.
1845	1	1
1846	1	—
1847	9	2
1848	13	4
1849	16	3

List of Objects observed.

steropoda—Young of Eolis. *Tunicata*—Tadpole of Botryllus. *Cirrho-*—Young of Barnacles, and cast skins. *Crustacea*—Opossum shrimp, , Oniscus ceruleanus, Polyphemus, Cyclops, Cypris. *Annelida*—A small mming Annelide. *Zoophyta*—Laomedea, &c. *Acalephæ*—Willsia stellata, enia dinenia, Sarsia prolifera, Thaumantias octona, Thaumantias incon-ia, Bouganvillia nigritella, Lizzia blondina, Lizzia octopunctata, Beroë, w one, Diphydiæ, probably Cuboides vitreus, and one something like e pentagona, both new to the British seas. Several other objects, much he young of Zoophytes.

rof. E. Forbes said, the animals observed by Mr. Peach were very resting. One of the animals described by Mr. Peach was new to

the British coasts, but had been described on the French Another of the creatures supposed by Mr. Peach to be new hydroid state of a species of Medusa.

Dr. Pring has also communicated to the British Associati experiments made at Weston-super-Mare, on the *Noctiluca mil* animalcular source of the phosphorescence of the British Seas vesicular animal, not more than one-thousandth part of an diameter, which possessed very remarkable luminous prope curred some times in so large quantities, and was so lumino give the sea the appearance of a sheet of fire. After detailing i ture, the author gave the results of experiments upon the light Galvanism increased the luminosity; oxygen gas and carbonic increased the light, but the latter most speedily killed the sulphuretted hydrogen quickly destroyed the light; nitrogen oxide, and hydrogen, produced little or no effect on the lu strong mineral acids increased for a moment, but speedily a destroyed the light; ether instantly destroyed the life of the chloroform increased the light, and then destroyed the anin author then instituted a comparison between his own experi those of Prof. Matteucci on the glow-worm; and after exa various theories put forward to account for the luminosity o concluded that the phenomena could not at present be refer more general fact with which we are acquainted.

Mr. R. Taylor referred to Ehrenberg's papers, and to h that the luminosity of animals depended on electricity. Edwards quoted facts which could not be explained, the supposition of the cause being electricity, phosphor combustion. Sir E. Belcher related a number of facts wit the phosphorescence of the ocean, and expressed his convic was not a living process.—*Athenæum*, No. 1147.

SCOLOPENDRA.

Mr. R. Ball has exhibited a drawing, and described to Association the structure, of a specimen of Bryarea Scolop in Dublin Bay.

Prof. E. Forbes stated that he had first discovered this British Seas. He had caught it in a drag-net off the Ze also in Cornwall. It was an anomalous animal. He had no it more accurately, as Mr. H. Goodsir, who was with the dition, had stated to him in the last letter he had written, t found it in very large numbers in the Arctic Seas. He con the animal had a molluscan type, and he might be placed n malous genus Sagitta. Prof. Allman had also examined t creature, and from the structure of the seta he was incline it as belonging to the Annelidans.

CILIOGRADA.

Prof. E. Forbes has read to the British Association, a

ucumis, and the genera and species of Ciliograda, which have ınd upon it."

e Birmingham meeting of 1839, the author, in conjunction of. Goodsir, communicated an account of the British ciliograde e.* They then announced the existence in our seas of the true ıcumis of Otto Fabricius, which they had taken on the coast of . Since that time, Prof. E. Forbes has availed himself of pportunities for the observation of these animals, and has been ful in discovering some new features in their economy. He en the beroe cucumis in many parts of the coasts of England otland, from the Zetland Isles to the Isle of Wight, and has n able to find any sufficient differences among the individuals rant the recognition of more than one species. They vary in size and colour; in the Hebrides they are not unfrequently hree inches in length, but are usually very much smaller on glish shores. He has found that apparently at certain seasons, ous individuals of this beroe produce in the line of their ciliary from the belts of motor tissue, at the base of the cilia, ovate, e, pedunculated bodies of a bright orange colour. These can produced from the finer ciliary circles of the mouth, and of the extremity. When the animal is in this state, any irritation near ary ribs, causes it to contract the neighbouring portion of the ver them, so as to protect them, sheathing the eggs as it were membranous canals. Particular attention is directed to these ıles or egg-like bodies, which may prove to be intermediate of the beroe. When the animal is in egg, it is extremely irri- and when irritated gives out the most brilliant vivid green phos- cent light, always from the vessels beneath the ciliary ribs, and o other part. The badness of the majority of delineations of this , and a misconception of its true structure, have caused nume- lse species, and several genera to be constructed out of one.

. Milne Edwards said, that many of Prof. Forbes's observations uite new. He was not aware that the mode of gemmation, de- l as beroe cucumis, had ever been before noticed.

ZANTHIDIUM OF EHRENBERG.

F. AGASSIZ maintains, that the Zanthidium is not an animal, posed by Ehrenberg, but a plant of the family of Algæ, and that ınules, considered by Ehrenberg as eggs, were, in reality, the apsules. The entire capsule consists of beautiful hexagonal Prof. Gray remarks, that it differs from any genus of the pro- gæ that had fallen under his notice.

* Noticed in the *Year book of Facts*, 1849, p. 183 and 210.

BOTANY.

VITALITY OF SEEDS.

MR. H. E. STRICKLAND has read to the British Associati "Report of the Committee on the Vitality of Seeds," and ha a list of the species which had been planted and had grown duri last year.

Dr. Lankester suggested, that as the Committee had been in existence nine years, they should draw up a Report of the results ready obtained. The experiments amount now to nearly a thous and are quite sufficient to afford an examination for the purpose of certaining what were the conditions of the seed which enabled it m successfully to resist the action of the vital force for varying peri of time.

MORPHOLOGY.

MR. R. AUSTEN has described to the British Association, a Serie of Morphological Changes observed in *Trifolium repens*. Thes changes went on in the flowers. They consisted in the conversion of the various parts of the flower into leaves. Thus, the calyx, the petals, the stamens, the pistil, had all been seen to revert to the foliar type. These parts not only reverted to the form of the leaf, but many of them assumed the character of the leaf of Trifolium in the possession of three leaflets. The pod appears to be formed of the middle leaflet of a leaf, and in some instances leaflets were observed occupying the place of the ovules.

Mr. Henfrey considers these observations of much interest. The reversion of the pod to the form of the leaf was evidently opposed to the doctrine recently propounded by Schleiden, that the fruit of Legumi nosæ was a stem-pistil. He thought the observations of Mr. Austen tended to prove that the stamens in this case were formed by what the French called *dédoublement*.

Mr. Austen then reported "On some Changes in the Male Flower of Forty Days' Maize." In these flowers, a large proportion were single like ears of wheat; another peculiarity was, that they presented number of heads of naked grain. With the conversion of the stamen into pistils in the terminal panicles, there was frequently a suppressio of the lateral cobs.

Mr. Henfrey thought that a change of external circumstances migh produce the conversion of male flowers into pistils. This would pro bably explain how it was that maize could not be successfully cultivate in this country.

FUNGUS THEORY OF CHOLERA.

THE President of the Microscopical Society (Mr. Busk), has com municated a paper on the recent announcement of the discovery of Fungi as a cause of Cholera. He stated that, from his position

on to the Dreadnought, he had, unfortunately, had very extended r-tunities of examining the bodies of those who had died of cho-

In making remarks on the theory recently announced, he confined .ttention to the published papers and drawings of Drs. Brittan, l, and Mr. Swayne, of Bristol. In these drawings, bodies osed to be fungi, from the air and water of several cholera pa-s, were represented. With regard to the whole of the bodies seen e air and water, and to a great proportion of the bodies found r the other circumstances, they were too indefinite and varied in appearance and characters to be for one moment referred to the species. The large bodies found in the matters passed from the m were most constant; and after a careful examination of speci-s from Dr. Brittan and Mr. Swayne, with their drawings and with imens procured by himself, he believed they were of the following re:—1st. A true fungus, very rarely seen; being a species of do, and identical with that found in bread affected with smut. s fungus is very common in bread; and as it is not easily sted, its presence is readily accounted for. 2nd. Bodies of less than the last, but under high magnifying power and defective nination, looking very much like them, and consisting of small icles of the inner membrane of the grain of wheat. These bodies be easily seen in the coarser kinds of bread; and drawings were bited giving their character before being taken into the body, h corresponded precisely with the specimens obtained from cho-patients. The presence of these bodies was also to be accounted 3rd. Bodies of lighter colour and more delicate. These were d to agree precisely with grains of starch from wheaten flour: drawings of both were exhibited. From these observations, Mr. k was led to conclude that the fungus theory derived little or no ort from the facts brought forward by the microscopists of tol; although he did not deny that subsequent investigation might to the discovery of something which had hitherto eluded observa-—*Athenæum*, No. 1147.

Correspondent of the *Athenæum* throws some light upon the ry of the Bristol microscopists, by stating that the cholera was t virulent in that city in neighbourhoods where low-priced, inferior, mouldy bread, had been sold in large quantities.

FAIRY RINGS.

ROF. BUCKMAN has read to the British Association, a paper on e phenomena. After detailing the experiments of Mr. Way, on composition of fungi forming the fairy rings, Prof. Buckman de-ed the various species which form fairy rings in the neighbour-l of Cirencester. He stated that at different seasons of the year, ess than three species of Agaricus appear on the same ring. The ies of grasses, also, that compose the ring, are found to be con-tly the same in the inner and outer parts of the circle in the rings ained. The Cirencester species of fungi in the rings are edible, much sought after by the students of the College.

The Prince of Canino stated, in reference to a remark of Prof. Buckman, that the English *Agarcius campestris* was not sold in the markets of Rome; and that this fungus so closely resembled one that was extremely poisonous, that it was thought better to get rid of them altogether than to run the hazard of confounding the one with the other.

ACTION OF CARBONIC ACID ON PLANTS.

Prof. Daubeny has read to the British Association, a report "On the Action of Carbonic Acid on Plants allied to the fossil remains found in the coal formation." The apparatus used in these experiments was so constructed that a constant supply of carbonic acid could be kept up, so that plants or animals exposed in it were constantly subjected to the same quantities. The results of the experiments were: first, the quantities of carbonic acid, not exceeding 5 per cent., did not appear to affect injuriously species of ferns or pelargonium; second, a quantity amounting to 20 per cent. injured plants exposed to it; third, the quantity of oxygen given out by plants was not found to be increased by the quantity of carbonic acid to which they were exposed; fourth, on exposing animals to the action of carbonic acid, it was found that frogs and many fish could live in an atmosphere charged with 5 per cent. of carbonic acid. From these experiments, Prof. Daubeny concluded that no objection could be offered to the theory of a large proportion of carbonic acid having existed in the atmosphere in the early periods of the world's history. —*Athenæum*, No. 1142.

EFFECT OF AMMONIA ON PLANTS.

The results of the experiments of MM. Fresenius, Grayer, and Kemp, to ascertain the quantity of Ammonia contained in atmospheric air, have been noticed at page 133 of the present volume. The following passage pertains more especially to the present section:—

If it be true that night air is richer in ammonia than the air of the day, this fact may be explained by the phenomena presented by the nutrition of plants, by the circumstance that the ammonia which accumulates in the air during the day and during the night is dissolved and precipitated by the dew at sun-rise.

THE POLAR PLANT.

Major Alvord has discovered a singular plant of the Western Prairies, said to possess the peculiarity of pointing north and south, and to which he has given the name of Silphium Laciniatum. No trace of iron has been discovered in the plant; but as it is full of resinous matter, Major Alvord suggests its polarity may be due to electric currents.—*Medical Times*, No. 528.

CALIFORNIAN PLANTS.

Mr. Henderson has exhibited to the Horticultural Society, a plant of *Pentstemon cordifolius*, a new Californian, brownish, orange-

owered shrub, about which in its present state little can be said; but it has not yet been in this country sufficiently long to test its true character.

In the Society's Garden has been reared a fine specimen of the red-flowered *Zauschneria Californica*, a plant which everbody should possess; for, should it not prove hardy, as is expected, it will at least make a handsome greenhouse plant.

THE TEA PLANT IN THE UNITED STATES.

MR. J. SMITH has succeeded in the culture of the Tea Plant, near Greenfield, in South Carolina. In the fall of 1848, about 500 plants were received from China *viâ* London, and in December they were planted in his garden. A considerable quantity of tea seed was planted at the same time. Notwithstanding the severe winter and spring, the plants, which were left to take care of themselves, were unharmed. Several specimens of the green and black plant were in seed, and in the following year Mr. Smith expected to pick tea. The tea-seed failed from being planted at a wrong season.

VEGETABLE PRODUCTIONS OF ALGERIA.

MR. G. MUNBY has given to the British Association, a sketch of the various plants which characterize the vegetation of Algiers. He mentioned those which are used as the food of man. Amongst these, he entered into a discussion of the species of plants which had been supposed to yield the lotus of the ancients. He also described the *Lichen esculentus*, a plant of rapid growth, belonging probably to the order of fungi, and which covers some of the desert wastes of Algeria. It has a sweet taste, is eaten by the Arabs, and is quite capable of sustaining animal life. Mr. Munby suggested that the manna recorded in Scripture might be a production of this kind.

MANNA.

A CORRESPONDENT of the *Gardener's Chronicle*, writing from Erzeroom, says:—"About the 18th or 20th of April last, at a period when there had been, for a whole fortnight, very rainy weather, with strong winds from the S.E. and E.S.E., the attention of the shepherds and villagers frequenting the country near Byazid, close to Mount Ararat, was attracted by the sudden appearance, in several localities, of a species of lichen scattered in considerable quantities over certain tracts, measuring from five to ten miles each in circumference. No proof has been adduced of any one having seen the fungi fall; but as the first intelligence was brought by villagers who, early one morning, had observed the lichens strewed over a tract of ground where they had not observed any on the evening before, it is probable that the showers must have taken place during the night. In some localities, the one or the other kind of lichen alone was found; in others, the two species mixed. On the 19th of June, another quantity of lichen was discovered; and as the spot was a well-frequented one, it seems likely that the fall had occurred only a short time previously. From

all accounts, the quantities collected had been very great. Dr. Heinig says that a person could collect at the rate of 1½ lb. in an hour, which, considering the lightness of the product, is a tolerable quantity. The substance is ground up with wheat and made into bread, or eaten simply in its raw natural state."

Dr. Thomas Anderson has communicated to *Jameson's Journal*, No. 92, a paper on a new species of Manna from South Wales, which, on examination, has been found to possess no mannite, and is peculiarly remarkable from its possessing a regularly organized structure. This specimen was originally discovered in the interior of Australia Felix, to the north and north-west of Melbourne, upon the leaves of the mallee plant, *Eucalyptus dunnosa.* It is known to the natives by the name of "lerp," pronounced "glerp." It is very sweet, and is formed by an insect on the leaves; in appearance it is like a flake of snow, it feels like matted wool, and tastes like the ice on a wedding cake. It is very nutritive, the natives becoming fat during the season in which it is found. It adheres but slightly to the leaves, and is immediately washed off by a shower of rain. The blacks say the lerp is not in any way produced by an insect, but that it is a spontaneous production of the mallee or gum-scrub when very young, say a foot or eighteen inches high, and that it grows on either side of the leaf; that old mallee, or mallee about eighteen inches high, does not produce lerp. It differs very strikingly in its external appearance, as well as in constitution, from all the other species of manna. It contains neither mannite, nor the sugar obtained by Johnston from the manna of the *Eucalyptus mannifera.* Dr. Anderson details the chemical examination of this curious substance, and observes as to its origin:—"All the species of manna regarding which we have explicit information appear to be exudations consequent upon the puncture of an insect, and they are composed of substances entirely soluble in water, which may easily be conceived to exude in solution, and gradually dry up in the rays of the sun, as indeed is actually the case with common commercial manna. But in this manna, we have present the insoluble cellulose, with starch, which is absolutely insoluble, and inulin, which is sparingly soluble in cold water; and it is very difficult, under any circumstances, to suppose that these substances could have been produced as a consequence of puncture; and, still more so, when it is taken into consideration that the whole substance is possessed of a definite organization." Dr. Anderson considers that far more distinct evidence than we possess is required to establish its insect origin. Entomologists are of a different opinion; and Mr. Newport has gone so far as to establish, on the strength of it, an entirely new genus of insects, to which he has given the name of Aspisarcus, from ασπις a shield, and αρκυς a net.

OXALIS CRENATA.

This tubercle is stated by Baron de Suarcé (who has cultivated about two acres and a half of it upon his own estate in the south of France) to possess a larger degree of nutriment than most of the fari-

that form the basis of human food in our climate. t of the crop produced on two acres and a half culti- as ten tons, from which three tons of flour was ob- the stems of the plant—which may be cut twice a be eaten as a salad or spinage—ninety gallons of a e obtained; which, when mixed with three times its is well adapted for drink. The acid, if fermented and equal acidity with vinegar, is superior to the latter curing or preserving meat, as it does not render it ınicate to it a bad flavour. The flour obtained from ıata is superior to that obtained from potato, maize, or it makes an excellent light bread when mixed in the one-fourth with corn flour. This is not the case with ır buckwheat flour. The Baron stated that the Oxalis originally from South America; that it is hardy and ıange of temperature, and grows readily in any soil— t, when once introduced, to eradicate it.—*Proceedings of Arts.*

STATISTICS OF NUTMEGS.

ıal of the Indian Archipelago, Vol. iii. No. 1, appears ıaper upon this subject, with sufficient data to enable e estimate of the culture and produce of the different ıdian Archipelago, where the Nutmeg Plant is culti- Straits settlements, the cultivation is extending very e production, of course, keeps pace with it. It was ginning of the present century that nutmeg planting into Pinang, a number of spice plants having been Amboyna by the East India Company. In 1848, e table given by Dr. Oxley, the total number of trees estimated at 55,925, of which the numbers in bear- 14, and the produce 4,085,361 nuts, besides mace, ted about 1 lb. for every 433 nutmegs. In Singapore, is extending very rapidly. In one district (Tanglin) not less than 10,000 trees planted upon barren-look- 843; and a number of Chinese are forming planta- ıt parts of the island. The average yearly consump- gs and mace in Great Britain is estimated at about The produce of the Straits settlements in 1842 was ıutmegs, 147,034 lb., and mace, 44,822; thus being al to the whole consumption of Great Britain. The it has been estimated, takes about 280,000 lb. of nut- 00 lb. of mace; India about 216,000 lb. of nutmegs, of mace; and China about 15,000 lb. of nutmegs, 00 lb. of mace. As these quantities, however, would production of nutmegs alone above 250,000 lb., it is ıre now considerably under the real amounts. In ten 32 to 1842, the exports of nutmegs and mace from ebled, and from the very great extension in the culti-

vation which is constantly going on, it is probable that the same re-sult, at least, will take place in the ten years succeeding to the above period, viz., from 1842 to 1852. During the ten years, from 18[illegible] to 1842, the price of nutmegs in Pinang fell from ten to twelve dollars per 1000, to from four to five dollars per 1000. They have since kept at the latter rate; but with the large accumulation which this occasions, and the enormous increase in the production, the price must, sooner or later, give way. Already, the influence of Free-trade has penetrated into the so long jealously-guarded Moluccan regions. The making of Minado and Kima free ports may only be the prelude to opening the Spice Islands themselves to the general trade, a measure which, of course, would entail along with it the necessity of abolish-ing the monopoly of spices.

CLOVES OF AMBOYNA.

THAT which, above all, has made Amboyna so precious, is the cul-ture of the Clove (the flower-buds of the *Caryophyllus aromaticus*). In an average year, the crop of cloves may be reckoned at 250,000 or 300,000 lb. There are years, like those of 1819 and 1820, when the quantity has been much surpassed; but then, in others, the crops have been less: in 1821 it did not amount to 100,000 lb.—*Journal of the Indian Archipelago and Eastern Asia*, Vol. iii., No. 1.

DISTRIBUTION OF FLOWERS IN A GARDEN.

THE principal rule to be observed in the Arrangement of Flowers is to place the blue next to the orange, and the violet next to the yellow; whilst red and pink flowers are never seen to greater advan-tage than when surrounded by verdure and by white flowers: the latter may also be advantageously dispersed among groups formed o blue and orange, and of violet and yellow flowers. For although clump of white flowers may produce but little effect when seen apar it cannot be denied that the same flowers must be considered as indi pensable to the adornment of a garden, when they are seen suital distributed amongst groups of flowers, whose colours have been sorted according to the law of contrast. It will be observed by th who may be desirous of putting in practice the precepts we have b inculcating, that there are periods of the horticultural year wl white flowers are not sufficiently multiplied by cultivation to en us to derive the greatest possible advantage from the flora of our g dens. Plants, whose flowers are to produce a contrast, should b the same size, and in many cases the colour of the sand or gr composing the ground of the walks or beds of a garden shoulc made to conduce to the general effect.

In laying down the preceding rules, it is not pretended to as that an arrangement of colours, different from those mentioned, i not please the eye; but, in adhering to them, we may always be tain of producing assemblages of colour conformable to good ta whilst we should not be equally sure of success in making other rangements. To the objection that might be made, *that the gree*

ich serves, as it were, for a ground for the flowers, effect of the contrast of the latter, it is replied that case; and, to prove this, it is only necessary to fix on een silk two kinds of flowers, conformably to the ar- he coloured stripes, and to look at them at the distance ces. This admits of a very simple explanation; for, as ye distinctly and simultaneously sees two colours, the rivetted that contiguous objects, especially when on a , and where they are of a sombre colour, and present a confused manner to the sight, produce but a very on.—*Chemical Reports and Memoirs of the Cavendish*

BLOOMING AGAVE.

been in bloom at the Apothecaries' Garden, Chelsea, an cies of Agave, which appears to be the *A. Mexicana* of e general aspect of this plant before it gave evidence of not dissimilar to that of *A. Americana;* but in its it proves quite different from that species, especially nent of its inflorescence, which, instead of forming a l, with horizontal branches, has the branches ascending dense head, which becomes thicker and broader up- absence of any particulars of this plant, considering turally a somewhat less massive appearance than the e, it appeared to be a full-sized specimen, the spread of about 7 feet, their height 4 feet, and the height of the , measuring from the base of the plant, 19 ft. 6 in. l 24 branches, and these were again subdivided into ranches, terminated each by a cluster of flowers; the ers was estimated at about 4000; thus $21 \times 8 \times 24 = 4032$. flowers were found on examination, and especially l, to have a strong and very disagreeable odour, at of decomposing cabbages. They contained also a e taste of which was a compound of sweetness and The flowering stem became visible about the middle bling in its first stages of progress a giant head of as- growth was rapid for three-fourths of its height, and ches became developed, when its progress was less first blossoms, those of the lowest and least vigorous e panicle, were developed in the first week of Septem- r's *Chronicle.*

OF FORTY-DAY MAIZE IN ST. JAMES'S PARK.

t having been entertained whether the Maize plant, lmost spontaneously in tropical climates, could be suc- ated in this country, an experiment upon a small scale within the ornamental enclosure in St. James's Park, of the Commissioners of Woods and Forests. The *ed from the* Pyrenees, by Mr. Keene,) was put in on

the 24th of May; the spot abutting on a nursery of young trees and flowering shrubs, which, as is well known, absorb a large proportion of the nutritive sap of the soil, whilst the foliage deprives the neighbouring plants of the benefit of heat, light, and air,—all of which contribute to healthy vegetation. Notwithstanding these drawbacks, the young shoots came up well, and when the plants began to feel the cheering influences of light and air with a hotter sun, the success of the experiment soon became evident; the greater number of the plants having grown one inch per day during the sultry weather of last autumn. The crop was harvested on October 10; the grain was perfectly formed, full, and ripe, and the cobs were much finer than those grown on the Continent. The amount of crop appeared to be at the rate of about fifty bushels per acre; and, in the opinion of some experienced agriculturists present at the harvest, this quantity is producible on the average, from ordinary soil, in ordinary situations, and with the ordinary quantity and quality of manure. Some American corn and Barbadoes corn had been sown alongside Mr. Keene's maize, at the same time, and under exactly the same circumstances and conditions; but neither ripened. The result of this harvest is interesting, when it is matter of fact that the bread from this corn, which forms not merely the chief but almost the only food of the fine peasantry on either side of the Pyrenees, is producible, even in England, at a halfpenny the pound. It is calculated that 30 acres of maize would be worth £400, if the soil be of an average quality and properly drained. Its cultivation has been deemed of so much importance by the Council of the Royal Agricultural Society of England, that two very able papers have already been published in the Society's journal, explanatory of the properties of this plant, and pointing out the best system of culture.*

A Correspondent of the *Illustrated London News*, No. 392, who has lately returned from the United States, where maize is grown in great quantities, has ascertained that the price of this *corn*, as it is called there, is only 12½ cents, or 6d. the bushel of 56 lb., in any part of the West—Ohio, for example; and at this price, even, is grown at a good profit. In the present state of things, therefore, it may always be purchased in the home market for a less sum than it could be cultivated. A barrel of flour, 196 lb. = 4½ to 5 bushels of wheat, sells at New York, U.S., for 5 dollars, or 20s. sterling, English. Agricultural labour in Ohio is 50 cents per day = 2s., *with board and lodging*. Navvies on railroads get 4s. per day, board and lodging included, in the United States. In 1848, the Americans grew 900,000,000 quarters of grain, and used only for themselves 300,000,000.

* A pamphlet of practical information has appeared on the subject, with the following title:—"Facts for Farmers. Maize: its Culture and Uses as a Green and a Corn Crop; with the Reasons why Attempts to Cultivate it in England have hitherto failed. Notice of a New Quick-growing Early Sort, suited to the Climate of England, called Forty-day Maize; with Instructions *for its Growth*, and the proper Season for Sowing. Also, the Mode of Growing *Turnips* and Incarnate Clover, as intercalated in the Maize Culture and *practised* by William Keene, Engineer of Mines, &c." Longman and Co.

THE GIGANTIC WATER-LILY (VICTORIA REGIA) IN FLOWER AT CHATSWORTH.

The earliest public notice of the discovery of this extraordinary South American Water-lily was given by Dr. Pöppig in 1832, who, in his travels through Chili and Peru, records it as growing in the Igaripes, which are large branches of the river Amazon. Before this period, however, other botanical travellers had discovered it; as Haenk (a Spaniard), Bonpland (the companion and fellow-traveller of M. Humboldt), and D'Orbigny (a French botanist). This last gentleman furnished dried specimens of the leaves and flowers to the Museum of Natural History at Paris, in 1828.

In 1837, Sir Robert Schomburgk detected it growing in the river Berbice, in British Guiana, where he was travelling (under the patronage of her Majesty's Government,) on account of the Geographical Society of London. He had specimens collected, and drawings made on the spot, which were afterwards brought to this country, and from which the first full description and figure of this wonderful plant were published, the same year.*

In 1846, the first seeds were introduced by Mr. Bridges to the Royal Gardens at Kew, from which plants were raised; and from these growing plants, and Sir Robert Schomburgk's drawings, a series of fine plates were prepared by Sir William Hooker, and published in the *Botanical Magazine* for 1847.

The plant now growing at Chatsworth was received from Kew on Friday, August 3rd. It had then only four expanded leaves, and a fifth opened in the course of two days afterwards. The largest of these leaves was 5½ inches across, and about 16½ inches in circumference. The box in which the plant was enclosed when it was received, is 13½ inches square and 8 inches deep, and was, in every respect, large enough for the purpose.

A tank (12 feet square, and 3 feet 4 inches deep) was prepared in one of the large stoves. About five cartloads of soil were placed in the centre of this; and, when the whole was filled up with water, and had become sufficiently warm, the plant was placed in the centre of the soil: this was on August the 10th. By the end of September, 19 leaves had been formed, the largest of which measured 3 feet 6 inches in diameter, and nearly 11 feet in circumference—at which time it became necessary to enlarge the tank to double its former size; and even then the plant was much cramped, as the largest leaves measure 4 feet 11 inches in diameter, and nearly 14 feet in circumference. The construction of the leaves is also very peculiar, and the weight they are able to sustain is astonishing. An actual experiment was tried at Chatsworth, by placing a young lady upon one of them, who was borne up for some time with perfect safety. The leaves are also (when separated) very heavy; and Mr. Bridges relates that, on his discovery of the plant in Bolivia, he was very desirous to collect both leaves, flowers, and seed-vessels: these he had suspended to poles,

* Engraved as the Frontispiece to the Arcana of Science, 1838.

with small cord tied to their stalks. Two Indians—each taking on his shoulder an end of the pole—carried them into the town.

The first flower-bud made its appearance at Chatsworth on Thursday, November 1st, and expanded on Thursday, the 8th. The buds rose about six inches above the surface of the water, beginning to open in the evening; the flowers were then of the purest white, and measured about ten inches across: the following day, towards evening, they began to exhibit a rich pink in the centre, and during the night they were fully expanded; the numerous outside petals being reflexed and spreading upon the surface of the water, whilst the fine pink centre was elevated nearly erect,—altogether forming a most singular and beautiful object. After this expansion, the whole of the petals assumed a pinkish tint, and the flower gradually became flaccid, fell on one side upon the water, and, by the third evening, faded away. During their expansion, they emitted a peculiar and pleasant fragrance, not unlike that of some kind of ripe fruit; but after the full expansion, on the second night, this was no longer discernible.

The seed-vessel is prickly, and, according to its original discoverers, grows to nearly the size of a child's head: the farinaceous seeds, of which it is full, are roasted by the natives of Guiana, and eaten as food; hence the plant has been called *water maize*, but more generally it is known in its native habitats by the name of *Irupé* or *Yrupé*, literally water-platter, the leaves resembling the broad dishes used there.

Mr. Paxton has had the honour of presenting a leaf and flower of the above plant to her Majesty and his Royal Highness Prince Albert at Windsor Castle.—*Illustrated London News*, No. 399; which contains, also, an engraving of this majestic plant.

EFFECT OF CHARCOAL ON FLOWERS.

A Correspondent of the *Paris Horticultural Review* writes:—"About a year ago I made a bargain for a rose-bush of magnificent growth and full of buds. I waited for them to blow, and expected roses worthy of such a noble plant. At length, when it bloomed, the flowers were of a faded colour, and I discovered that I had only a middling multiflora, stale-coloured enough. I then covered the earth in the pot in which my rose-bush was about half an inch deep with *pulverised charcoal!* Some days after, the roses bloomed, of a fine lively rose colour. When the rosebush had done flowering, I took off the charcoal, and put fresh earth about the roots. When it bloomed, the roses were, as at first, pale and discoloured; but by applying the charcoal as before, the roses soon resumed their rosy red colour. I tried the powdered charcoal likewise in large quantities upon my petunias, and found that both the white and the violet flowers were equally sensible to its action. It always gave great vigour to the red or violet colours of the flowers, and the white petunias became veined with red or violet tints; the violets became covered with irregular spots of a bluish or almost black tint. Many persons who admired them thought that they were new varieties from the seed. Yellow flowers are, as I *have proved*, insensible to the influence of the charcoal."

Geology.

RESEARCHES IN PHYSICAL GEOLOGY.

II. of these "Researches," by Mr. H. Hennessy, has been
cated to the Royal Society, by Major Beamish, F.R.S.
mmunication, the author states that having, in Part I. (read
ciety in December 1846), endeavoured, by generalizing the
s on which is usually founded the theory of the earth's
t only to improve that theory, but also to establish a secure
researches into the changes which may have taken place
d at the surface of the earth during the epochs of its geolo-
ory, his object here is to discover relations between the
tructure of the earth and phenomena observed at its surface,
the effects of the reaction of the fluid nucleus, described in
pon the solid crust. This memoir is divided into sections,
taining a distinct investigation; and the statement of the
results is given at the end.

llowing are the geological deductions from the foregoing
ions:—

stability of the axis of rotation of the earth will progressively
luring the process of solidification.

employing the values of the constants obtained in Section IX.,
that the thickness of the earth's crust cannot be less than
and cannot exceed 600 miles.

earth's primitive ellipticity, when entirely fluid, was less
resent ellipticity; but their difference may be neglected.

zone of least disturbance existed near the parallel of mean
the directions of great lines of elevation should be in general
r perpendicular to the equator. Its non-existence there,
servation seems to show, proves at least that the variable
did not predominate over the constant. Since, as yet,
on goes to prove that such a zone does not exist on the
urface, we must provisionally conclude that the constant
greatly predominated over the variable; and consequently,
lirections of the lines of elevation must be comparatively

t great friction and pressure exist at the surface of contact
icleus and shell, is shown from the conclusions arrived at in
IV., combined with the important result obtained by Mr.
in his second memoir on Physical Geology (Phil. Trans.
207).

amount of elastic gases given off from the surface of the
apidly decreases as the thickness of the shell increases.

expression obtained for the variation of gravity shows that,
ular velocity of rotation of the earth remained unchanged,
rs on its surface would tend to accumulate towards the
or the increase of gravity, in going from the equator to the
uld be less according as the shell's thickness increased.

INTERIOR OF THE GLOBE.

THROUGHOUT the whole duration of geological times, th of the Globe should appear to us as a centre of continuous e which have sent enormous masses of iron to the surface; ' nations mingling their anhydrous products, sometimes w sedimentation, at other times interposing themselves unde of concentrated repositories, in the rocks elevated by t masses.—*Amédée Burat; in the Annales des Mines.*

ENGLAND THE CENTRE OF THE EARTH.

IF we divide the globe into two hemispheres, accor maximum extent of land and water in each, we arrive result of designating England as the centre of the form half; an antipodal point near New Zealand as the aqueous hemisphere. The exact position in England is the Land's End; so that if an observer were there rais height as to discern at once the half of the globe, he v greatest possible extent of land; if similarly elevated in the greatest possible surface of water.—*Quarterly Revie*

DOWNWARD PROGRESS OF THE GLACIERS OF TH

M. ED. COLLOMB, in a paper communicated to the *Universelle de Genève*, admits this problem to be ' adding: "Yet, if we set aside useless terms, it is only i meteorological phenomena that we can find the solution even be found in two proportions, which may be combin singly, and may be briefly expressed in the following ter

"1st. That the heat of the summers is no longer suf the Alps to arrest the progression of the glaciers into the

"2d. That the winters, without exactly being colder, p day a greater quantity of snow than in past ages."

The entire paper by M. Collomb will be found transl *son's Journal*, No. 93.

MARKS OF GLACIAL ACTION IN IRELAND.

IN a late visit to Ireland (says Mr. W. C. Trevelyan undoubted evidence of Glacial Action in the polishing a of rocks in several parts, as near Limerick, on the su cliffs at Kilkee (on the coast of Clare), and at Howth These points appear to me all too remote from any valley in which a glacier could have originated, for that the cause of their appearances; and, taken in comb similar instances which I have found in several parts of of Scotland and in Wales (likewise remote from any spo a glacier), I am inclined to the opinion that they have a great part of these islands having at one period been en with ice, like some of the Arctic regions at the present *also often* occurred to me, that the action of a mass of *is to be observed* in the broken edges of some of the *shaley rocks*, especially where the beds are nearly v

termination appears to have been broken or pushed aside, and ally in one direction, by the passage of a heavy mass over it, from the softness of the rock, it could not bear such a shock out fracture. This appearance extends sometimes for several between the surface-soil and the more solid rock; several good nples of which may be seen on the cliffs extending from Arbroath ards the Red Head, Forfarshire; on the summit of this promontory, rock, being much harder, has not been shattered, but shows marks polishing and scratching. May not the enormous triturating power such a coating of ice, as well as that of glaciers and icebergs, have med, from the destruction of the rocks with which they have come contact, much of the deep subsoils (clay, sand, &c.) with which at part of these islands abound?—*Jameson's Journal*, No. 92.

EDIBLE EARTH.

'HE Ampo, or Tanah Ampo, an earthy substance eaten at Samarang in Java, (its geological position already noticed in the year 1792 Labilardier,) occurs, according to M. Mohnike, in many points at ight of 4000 feet, among the secondary formations which extend n north to south in the island of Java. It is in general solid, tic; and is kneaded and formed into small rolls, which are dried a charcoal fire. These rolls are eaten with great avidity, and as licacy. Ehrenberg, on examining this earthy substance, discovered from three to four polygastrics, and thirteen phytolithaires, a umstance which seems to indicate that the earth or clay is a fresh-er tertiary deposit.—*Jameson's Journal*, No. 92.

VALLEY OF THE ENGLISH CHANNEL.

IR. R. A. C. AUSTEN, in a paper read to the Geological Society, :—The English Channel occupies a valley which may be described ne of depression between two parallel systems of elevation. This hown by the dip of the secondary strata on either side being to-ds its centre. The epoch of this depression will depend on the of the deposits included in it, which show that it has been un-water at many distinct periods. When the submarine forests, on many parts of the coast, grew, it must, on the other hand, e been at a higher level; and hence Mr. Austen infers that it was during the whole period of the coralline and red crag formations. se ancient forests not only pass below the present sea, but are ered by other formations, known as raised beaches. The materials ad over the bed of the Channel seem chiefly derived from the t line. For the first few fathoms depth the sea-bed is constantly nging; and the author has seen almost every portion of the south t in the condition of sand, gravel, or bare rock, at different times. onsequence of the prevailing direction of the winds, the shingle es constantly *from west* to east.—some pebbles found in the il bank being *derived* from rocks not found nearer than Torbay. he other hand, the raised beaches on the coast of Cornwall con-nany chalk flints which can only have come from the east

These seem to have been carried westward during the period, when the last depression of the Channel took place, it with the Northern Ocean area, when also blocks o rocks were carried south into it, like those found on th Sussex. At that time, however, the Wealden was dry lan northern drift, which may be traced into the valley of th thins out and disappears before reaching it; as is well se Reading and Reigate railway cuttings. The west of Engla also to have been above sea at that period, though divided Weald by a strait. These tracts are distinguished by E. and of elevation; and the same system prevails in South Wales south of Ireland, neither of which districts appear to have be merged at any time. The depth to which the abrading ac the waves caused by winds extends is not more than 40 to 5 The tidal currents reach much deeper; as shown by the rippl the surface over banks and shoals with a minimum depth of 40 fathoms, and over the Sole Bank at 80 fathoms, where the wa broken, even in the calmest weather. To this motion the distrib of materials over the sea-bed is owing. These, as shown in a colo map of the Channel, are carried outwards from the shore, and bec finer as the distance and the depth increase. The bearing of this geology is obvious—the sedimentary rocks now exposed being men the aggregates of the soundings of ancient seas. The present depos also increase horizontally and not vertically; so that they do not fi up the sea or diminish the depth shown by soundings. In conclusio Mr. Austen referred to the sudden increase in the depth of the sea, shown by soundings beyond the line of 2000 fathoms. On losin the bottom with a line of this length, 400 fathoms often fail to obta soundings. This remarkable line of sudden depression he conside to have formed the coast line of an old continent belonging to th middle tertiary period, which attained its maximum elevation in th interval between the pliocene and pleistocene marine beds.

THE LONDON CLAY.

In some observations made by Dr. Buckland, on a proposed Sew Tunnel, this eminent geologist asserted unequivocally "that the was not an atom of London clay between Rotherhithe Tunnel and th base of Shooter's Hill," and that "it glanced off at the north-ea corner of St. Paul's." Since that time, evidence of the most sati factory nature, and from unquestionable authority, has been obtaine that it does exist, and in large quantities, in places altogether denie in the speech of Dr. Buckland, as will be found in the followin statement:—At Greenwich marshes, opposite Blackwall, 55 ft. London clay; near the London Dock and St. Katherine's Doc 55 ft.; at Bermondsey, 55 ft.; near London Bridge, 130 ft.; and extending upwards, it was found at Lambeth, 161 ft.; at Westminster 170 ft.; at Kensington, 170 ft.; and at Brompton, 237 ft.; and fo a considerable distance above London Bridge the bed of the river i *cut in the blue clay.—Builder.*

TERTIARY DEPOSITS OF THE MORAY FIRTH.

The Rev. J. G. Cumming notices the fragments of red sandstone on Mealfourvonie and other mountains which seem to have been continuous; and states that it is probable the old red series at time covered the entire area of Scotland, at least north of the Clyde and Forth. Subsequent denudation has greatly reduced its extent, and it has been much disturbed by the intrusion of igneous rocks; the author placing a great outburst of granite, fracturing the rocks and forming the valley of the Caledonian Canal, at the conclusion of the lias period. The boulder clay, with the scratchings on the inferior rocks, took place during a period of subsidence, whilst the drift gravel originated in a rising condition of the land. The terrace at Inverness, on which the castle stands, is stated to be identical in age with the great drift gravel platform in the Isle of Man; both being fragments of that sea-bottom, which when upheaved, united the British Isles with each other, and with the continent of Europe, and which has since been gradually eaten away by oceanic currents. The dispersion of the boulders in certain directions is ascribed to a great current, originating probably in the union of a north-polar current with a modification of the present Gulf-stream, constantly setting in upon the northern and western shores of Great Britain and Ireland, with the climate of an arctic or subarctic character.

GEOLOGY OF BELGIUM.

M. A. Dumont has reported to the Académie Royale de Belgique, the completion of the Geological Survey of Belgium, commenced by him on the 31st of May, 1836, and the early publication of the geological maps of that kingdom. M. Dumont now proposes to compile mineralogical and geological statistics of Belgium; giving the localities of all useful matters—such as materials of construction, minerals, combustible bodies, &c.—which shall accompany the map. A similar design is contemplated by our own Geological Survey, which will add greatly to its value: and we understand that the price of the geological maps is henceforth to be reduced to the public.—*Athenæum*, No. 1112.

EMERY, CHROME, AND MEERSCHAUM IN ASIA MINOR.

Dr. J. Lawrence Smith, the American geologist, in a letter to M. Elie de Beaumont, states that he has discovered the existence of the oxide of zirconium in Emery, and of a new substance associated with emery coming from all the localities of Asia Minor and of Naxos. It is a micaceous mineral, having for composition silex 30, alumina 50, zirconia 4, lime 13, oxide of iron, manganese, and potash 3. Dr. Smith proposes to call it *Emerylite*.

Dr. Smith also states that in a journey to the south of Broosa (Anatoly, Asia Minor), he crossed a formation of serpentine and other magnesian rocks of considerable extent. Fifty miles from this he discovered *chromate of iron* disseminated in these rocks; and ten or fifteen miles further south (near the city of Harmanjick), there is

an abundant deposit of this mineral. A circumstance worthy of remark is, that this chromate of iron (the first that has been discovered in Asia Minor) is found in serpentine as elsewhere. This important fact will explain, to a certain extent, the formation of this chromate. It is well known that serpentine contains all the elements of chromate of iron, which, during the consolidation of this rock, might separate themselves by the force of segregation, so well known to operate in many geological phenomena. Two facts, which seem to confirm this supposition, are, first, the existence of the chromate of iron in masses, and not in veins; and, secondly, the pale colour of the serpentine associated with the chromate. One small specimen consists of a white rock, composed principally of carbonate of magnesia, in which small specks of chromate of iron are visible. It is possible that this carbonate is the result of the decomposition of the serpentine at the surface, by the action of water containing carbonic acid. It was only at this locality that Dr. Smith found crystals of the chromate, octahedral, but very small. This discovery is of great importance to the arts, and to the Turkish government, which proposes exploring the mine. In quitting the locality of chrome, and going north-east, Dr. Smith traversed, in several places, the serpentine containing veins of carbonate of magnesia, quite pure; and this occurs until the plains of *Eskihi-sher*, from different parts of which comes the meerschaum most esteemed in the arts. It is found in this drift in masses more or less rounded; the other pebbles are fragments of magnesian and horn-blende rocks. Dr. Smith adds, that he put a small piece of the meerschaum, well cleaned, in hydrochloric acid: it effervesced for some time, but did not change its form; it only absorbed the acid; the solution was found to contain chloride of magnesium nearly pure. Another proof that the meerschaum probably owes its origin to the carbonate of magnesia, is, that Dr. Smith found attached to the meerschaum, serpentine, similar to that found in contact with the carbonate of magnesia of the mountains.

NEW ADAMANTINE MINERAL FROM BRAZIL.

M. Dufrenoy has exhibited before the Paris Academy of Sciences, a specimen of a Mineral from Brazil, which appears to be to the diamond what emery is to corundum, as stated by M. Elie de Beaumont. Among some specimens recently sent to the Ecole des Mines, by M. Hoffman, a dealer in minerals, were two which were stated to be hard enough to polish the diamond; and, in fact, the hardness of these specimens was found to be superior to that of the topaz.

This substance was analysed by M. Rivot, mining-engineer, who had at his disposal one large fragment weighing 65·760 grs., and several small pieces, weighing rather less than 0·50 gr.; the latter only were analysed. The large fragment appeared to come from the same alluvial formation as that in which the Brazilian diamonds occur. Its edges are rounded by long friction; but it has not the appearance of a rolled flint. It is of a slightly brownish dull black colour. Viewed with a glass, it appears riddled with small cavities separating

small, irregular laminæ, which are slightly translucent and iri-t. The brown colour is very unequally distributed throughout ass. On one of the faces the cavities are linear, which gives fibrous aspect similar to obsidian. It cuts glass readily, and ches quartz and topaz; its density is only 3·012. The small ments subjected to analysis, weighed 0·444 gr., 0·410 gr., and 32 gr.: their densities were respectively 3·141, 3·416, and 3·255. These numbers indicate great difference in the porosity of the spe-ens; they lead, however, to the conclusion that the density of the stance is very nearly the same as that of the diamond. By means ong calcination at a bright-red heat in a covered crucible, the imens were not altered; they retained their aspect, hardness, and ght; they do not, therefore, contain any substance volatilizable by ination out of contact of the air. This result, certainly, does not re the igneous origin of these diamonds, but renders improbable idea expressed by M. Liebig, that diamonds are derived from the sformation of organic vegetable matter.

he three specimens were successively burned in pure oxygen gas in apparatus employed by M. Dumas for the combustion of the iond. The oxygen obtained from chlorate of potash was con-ed in a gasometer; it was dried and purified before it reached the bustion tube, by passing through two tubes containing sulphuric and pumice, and one tube with potash. Employing this method the precautions indicated by M. Dumas, 100 of the first speci-gave, carbon 96·84, ash 2·03; loss 1·13: second specimen gave, on 99·73, ash 0·24; loss 0·03: third specimen gave, carbon 37, ash 0·27; loss 0·36.

n the combustion of the first specimen, only one bulb-tube with ash was employed, so that a portion of the carbonic acid produced the combustion was lost; but in the other two experiments, in ch two bulb-tubes, containing potash, were used, the second in-ised in weight some centigrammes.

The last two analyses prove perfectly that the specimens are com-ed entirely of carbon and ash. The ash was yellowish; and in the t specimen it had retained the form of the diamond. When mined by the microscope, the ash appeared to be composed of ruginous alumina and small transparent crystals, the form of which ild not be ascertained.—*L'Institut; Philos. Magazine*, No. 230.

VALUE OF DIAMONDS.

MR. TENNANT, F.G.S., in a paper read to the Society of Arts, tes that Diamonds are in general weighed by the carat, which is a m well known to jewellers, and equivalent to 4 grains. Thus a dia-ond of

arat is worth	£ 8	10 carats is worth	£ 300
"	16	20 "	3,200
"	72	30 "	7,200
"	128	80 "	20,000
"	200	100 "	80,000

PHOSPHATE OF LIME IN THE MINERAL KINGDOM.

The agricultural importance of Phosphate of Lime has of late years caused more search to be made for this substance than formerly; though its occurrence, as a component part of certain organic remains and of some rocks, has been long known. As regards phosphate of lime and its dissemination, which modern researches have shown to be much greater, when sufficient quantities of rocks are examined, than would appear from the analyses of the small portions usually employed,—a matter of interest when we consider the phosphate of lime required for certain plants,—we should recollect that when free carbonic acid is present in water, the phosphate, like carbonate of lime, though not to the same amount, is very soluble. Hence, especially when, as noticed by Mr. Austen,* phosphate of lime is disseminated in the state of fresh coprolites amid detrital matter, and water containing free carbonic acid is present and can have access to it, the phosphate of lime would be in a condition to be removed and disseminated. Mr. Austen has alluded to the mixture of such bodies with vegetable matter, to the decomposition of which, with animal matter also, we might look for some, at least, of the carbonic acid that would aid the solution of the phosphate of lime. As in the case of the carbonate of lime previously noticed, when the solution of this phosphate met with the silicates of potash or soda, whilst percolating amid the rocks, the silicates would be decomposed by the carbonic acid, and the phosphate of lime thrown down. We should expect,—in the same manner as carbonate of lime often replaces the original matter of a shell which has been decomposed and removed from the body of a rock, leaving those cavities commonly termed casts,—that phosphate of lime in localities where, from accidental circumstances, it was somewhat abundantly filtering through rocks, would also enter these and other cavities, filling them under the needful conditions of de[illegible] In like manner as we find carbonate of lime separating itself [illegible] mud and silt in which it was disseminated, forming the nodu[illegible] common in calcareo-argillaceous deposits, should we also expe[illegible] seminated phosphates of lime to do the same under fitting cond[illegible] so that it would not necessarily follow, however true in nu[illegible] cases, that nodules containing much phosphate of lime were [illegible] litic. We can readily imagine circumstances very favourable [illegible] solution and spread of these phosphates amid layers of mud a[illegible] We find such phosphates surrounding some fossils, such as crus[illegible] from the London clay, leading us to infer a connection betw[illegible] animal matter and this substance.—*Sir Henry De la Beche's [illegible] versary Address for* 1849, *to the Geological Society.*

METAMORPHOSES OF TRILOBITES.

Sir R. I. Murchison has exhibited to the British Asso[illegible] *diagrams* of the development of Sao hirsuta, illustrating M. Bar[illegible] *observations* on the Metamorphoses of Trilobites.

* See *Year-book of Facts*, 1849, p. 226 and 227.

ıe Edwards remarked, that this discovery was equally in-
he zoologist and physiologist. Metamorphoses like those
and the Tadpole were formerly supposed to be excep-
ırdinary rule, until the researches of Harvey showed that
the egg underwent changes quite as extensive and re-
[t now appears to be a law of Nature that animals are
ıs they are observed at a period nearer their embryonic
t is of the highest consideration in Zoology to show
stages animals pass before arriving at their adult form.
tails of this paper, the reader is referred to the *Athe-*
1145.

TRILOBITES OF BOHEMIA.

ɪɪᴄᴋ Mᴜʀᴄʜɪsᴏɴ has received a letter from M. Barrande,
ho is preparing a work on the Silurian system of Bo-
who, in studying the various Trilobites which he has
hat country, has made a remarkable discovery in respect
ıt ancient fossil crustaceans in the crust of the globe.
has traced, for the first time, the development of a
ɜ *Sao hirsuta*), from its embryonary state to its adult
ıd has observed twenty successive stages, during which
cie undergoes very remarkable changes of organization,
a simple disc-like body to a fully formed trilobite with
ɘe thoracic segments and two caudal joints. This dis-
t only most interesting to physiologists, but highly im-
eologists, as diminishing the number of the so-called
eing ascertained that in a work recently published by
and Corda, upon the trilobites of Bohemia, the authors
than *ten genera and eighteen species* out of a part only,
ɜ of metamorphosis of the *Sao hirsuta*..—*Athenæum*,

LIAN FOOT-PRINTS IN THE OLD RED SANDSTONE.

has been read to the British Association, from Mr. I.
ɘrican Conchologist, to the Dean of Westminster, "On
ɼ of Reptilian Foot-prints in the Old Red Sandstone,
le, Pennsylvania." The foot-prints in question were
y Mr. Lea, in the gorge of the Schuylkill, in the Sharp
.r Pottsville, on a slab of sandstone, which is also ripple-
impressed by rain-drops: they consist of six distinct
n a double row, each foot-mark being doubled, by the
ɼing fallen into the track of the fore foot, but rather in
. The fore feet had five toes, three of which were appa-
with claws; the length of each double impression is 4½
ɜadth 4 inches; the outside breadth of the double track
the length of the step 13 inches; the impression of the
ıe tail is distinct, and occasionally obliterates part of the
ɔe *ripple*-marks are 7 or 8 inches apart. The foot-
ɪcribed as bearing a remarkable resemblance to those of
gator, and also as somewhat like those of the Chiro-

therium of the new red sandstone; but, as the animal was decid... peculiar, Mr. Lea proposes to call it *Sauropus primævus*. The ... logical position of the foot-marked sandstone is about 8,500 ... below the upper part of the coal formation, in which Dr. King ... discovered the foot-prints of a reptilian quadruped in the We... coal-field of America.

Sir C. Lyell stated to the Section, that until a recent period, indications of air-breathing animals more highly organized than in... sects were known below the Permian system. Dr. Goldfuss ha... however, discovered the skeletons of two reptiles in the coal ... near Trèves; and he was disposed to consider the rock described ... Mr. Lea as really belonging to the old red sandstone.

THE FOSSIL FOOT-MARKS OF THE UNITED STATES, AND THE ANIMALS THAT MADE THEM.

DR. HITCHCOCK has contributed to *the Transactions of the A... rican Academy of Arts and Sciences*, 2d Ser., vol. iii., Boston, 18... an elaborate memoir upon these researches. The learned a... has pursued the course usual in palæontology, of distinguis... the genera and species of the *animals* indicated by the fossil rem... and naming them accordingly. Although the remains are but ... marks, they point out, under the guidance of the unerring prin... of comparative anatomy, the habits of several animals, the clas... which they pertain, and the peculiarities, to some extent, ... species. These characters have been seized, and upon them ... descriptions and names are based. 51 species are included i... memoir, 12 of which are of quadrupeds, 4 probably of liza... chelonian, 6 batrachian, 2 annelids or molluscs, 34 bipeds, 3 ... ful; and of the bipeds 8 were thick-toed tridactylous birds, 1... narrow-toed trydactylous or tetradactylous birds, 2 were batra... and the remaining 8 either birds or reptiles, and probably the ... —*American Journal of Science and Arts*, No. 22.

RECENT FOOT-PRINTS ON MARL IN NOVA SCOTIA.

IN his "Travels in North America" (vol. i. p. 168), Sir C. ... has described these impressions formed by the Tringa when r... along the shore at low water in the Bay of Fundy. The tide... rise very high, and at neap tides, leave large areas exposed, ... spread with soft red marl, ready to receive the impressions ... drops and the tracks of birds or other animals, which, when ha... by the heat of the sun, are permanently preserved. In some ... specimens, the foot-prints are seen to penetrate through mo... one layer of mud, and to stand out in relief on the under side. ... are also marks of the feet of a cat; which have displaced sev... the inferior layers, but without obliterating the previous impr... of the feet of the birds.

FOSSIL RHINOCEROS OF SIBERIA, AND THE MAMMOTH NAT... THE COUNTRIES WHERE THEIR FOSSIL REMAINS ARE ...

MR. BRANDT, at the request of Humboldt, has comm...

ırg Imperial Academy, the results of his microscopical ex- f the remains of food found in the hollows of the teeth of ıvian Rhinoceros, of which the Academy possesses a com- m, still covered with skin. According to his researches, ıat this species of rhinoceros fed on the leaves and fruit of ılants; hence there is no reason for supposing that the ınimals found buried in arctic countries have ever lived in ıne. The bushy hair with which they were clothed, and es of mammoths found in an upright position, rather in-) the opinion that these species lived in the countries and re their fossil remains are now found, than to have re- ıe hypothesis of a sudden change of temperature of the to the opinion of the transportation, by inundation, of ns from a far distant country.—*Jameson's Journal,*

NEW LABYRINTHODON.

has been read to the British Association, "On a New ,abyrinthodon (*L. Bucklandi*, Lloyd), from the Sandstone vorth, Warwickshire," by G. Lloyd, M.D. Hitherto, nts of bones and teeth of this remarkable genus of Batra- es had been found in England, and the condition of these, h broken and extremely delicate and friable, was such as t they had not been transported from a distance or sub- :rition. The new specimen is a skull compressed between ıf sandstone, the greater part of it adhering to the upper owing the inner surfaces of the bones. It measures 11½ ength from the premandibular bone to the occipital con- ı inches across between the temporal bones. It exhibits a ıt of consolidation in the bones of the cranium; the orbits he characteristic double condyle well preserved, and there or more teeth in the maxillary bone, which are hollow, striated, and implanted in shallow alveoli to which they sed by their bases; in the bone, apparently corresponding r, are the vacant sockets of two large teeth. The position ril is preserved, and confirm the amphibious nature of the ıe bed in which it was found is undoubted Bunter Sand- eas all the former specimens came from the white sand- ırwick, doubtfully referred to the Keuper period.

ident of the Section stated that the indications of these eathing quadrupeds had long been confined to the foot- e ripple-marked sands, which had evidently been impressed weight of the animal on the shore. From the hand-like se impressions the unknown animal had received the name erium. Afterwards, the bones of several species of Laby- *vere discovered* both in Germany and England, which *he disproportion* in size of the hinder extremities a strong f *belonging* to the animals so prophetically indicated by s. Dr. Lloyd observed that five species were now known

in England; and as the teeth of his new species were only a quarter of an inch long, whilst others measured two inches, it was evidently one of the smaller animals.

The President of the Section pointed out the important conclusions of this Report, and especially called attention to the statement that the sea-wave and earth-wave travelled at different rates, but both with a rapidity of perhaps 20 miles in a minute; the motion communicated to the ground having the nature of a real wave, every particle describing an ellipse in space when the wave reached it. Sir H. De la Beche referred to the magnitude of the *secondary* effects of earthquakes, those permanent elevations and subsidences of the land which the author had shown were not the direct result of the earthquake wave travelling onward through the land or sea.

SAURIAN REMAINS FROM THE GREENSAND FORMATION IN THE UNITED STATES.

PROF. OWEN has described to the Geological Society, these fossils, brought to this country by Prof. H. Rogers. The first genus is the Mosasaurus, originally discovered in the chalk of Maestricht. A fine mandibular tooth of a species of this genus was exhibited along with some other bones. Among the latter were two long bones of the extremities, probably of the same species or individual, and more resembling the tibia and fibula of the larger lizards than the radius and ulna. If these and some other bones of the leg and foot have belonged to the mosasaurus, they indicate that the extremities of that great saurian were formed on the type of the existing Lacertia, and not of the Enaliosauria or marine lizards. Some other vertebræ seem to have belonged to an allied but distinct genus, for which the name Macrosaurus is proposed. In the collection there were also a vertebra, probably of Philosaurus, and others of a species of amphicœlian crocodile. Some other remains are important as evidences of the existence of the genus of the modern crocodile or alligator at a period anterior to the eocene tertiary. Of this genus, at least, two distinct species have been found.

FOSSIL APE.

M. PAUL GERVAIS has discovered in the upper tertiary stratum of Montpelier, a species of Fossil Ape, probably belonging to the *Macaque* genus. On comparing this discovery with that of M. Lartet in the Gers, and those made in the environs of London, it appears that fossil apes have been discovered in the three principal tertiary strata of western Europe; that is to say, in every part of the level of sedimentary earths in which the bones of mammalia abound. If man had existed at the period when these strata were deposited, the non-discovery hitherto of the slightest trace of human skeletons, or remains attesting human industry, would be very astounding. The discovery of these fossil apes is, therefore, an additional indirect proof of the very inferior antiquity of man on the earth.

MAMMALIAN REMAINS AT BRENTFORD.

Mr. J. Morris, in a communication to the Geological Society, says:—"More than thirty years ago Mr. Trimmer obtained some valuable remains from this locality. The railway works in that neighbourhood have recently exposed some interesting sections, and afforded a considerable number of mammalian bones, and a few shells of recent freshwater species. The deposit seems the result of fluviatile action, when a river, far more deep and extensive than the present stream, flowed along the valley. The mammalian remains are bones of the elephant, rhinoceros, hippopotamus, aurochs, short-horned ox, red deer, rein-deer, and great cave tiger or lion. The occurrence of the Arctic rein-deer with the other species considered indicative of a more tropical climate, is very interesting, as well as that of the tiger, hitherto only found in ossiferous caverns. The age of the deposits seems still rather uncertain. It is important to remark that it is generally along those valleys where the present drainage of the country is effected, that we find the most extensive deposits of mammalian remains and recent shells, and consequently that very little alteration can have taken place in the physical configuration of the country since their deposition."

THE IGUANODON AND HYLÆOSAURUS.

Dr. Mantell has communicated to the Royal Society, "Additional Observations on the Osteology of the Iguanodon and Hylæosaurus." This memoir is supplementary to the author's former communications to the Royal Society on the same subject; and comprises an account of some important additions which he has lately made to our previous knowledge of the osteological structure of the colossal reptiles of the Wealden of the South-east of England.

The acquisition of some gigantic and well-preserved vertebræ and bones of the extremities from the Isle of Wight, and of other instructive specimens from Sussex and Surrey, induced the author to resume his examination of the detached parts of the skeletons of the Wealden reptiles in the British Museum, and in several private collections; and he states as the most important result of his investigations, the determination of the structure of the vertebral column, pectoral arch, and anterior extremities of the Iguanodon. In the laborious and difficult task of examining and comparing the numerous detached, and for the most part mutilated bones of the spinal column, Dr. Mantell expresses his deep obligation to Dr. G. A. Melville, whose elaborate and accurate anatomical description of the vertebræ is appended to the memoir. The most interesting fossil remains are then detailed; and the memoir concludes with a summary, in which Dr. Mantell states that the facts described, confirm in every important point the physiological inferences relating to the structure and habits of the Iguanodon and Hylæosaurus, enunciated in his former communications; and thus, after the lapse of a quarter of a century, he concludes his attempts to restore the skeletons of the colossal saurian herbivora, of whose former existence a few water-worn teeth ar

fragments of bones were the only indications, when, in 1825, he first had the honour to submit to the Royal Society a notice on the teeth of the Iguanodon.

MEGATHERIUM AND MYLODON.

A LARGE quantity of bones of the Megatherium, the Mylodon, &c., has been found not far from one of the railways in the borough of Southwark. The number of bones in many instances in perfect condition is considerable, and the *mélange* of mediæval and Roman *débris*, with which they are mixed up, seems at first sight to baffle all conjecture as to the time of deposit; they seem, however, to lie mostly superimposed upon a soft muddy clay. The discovery is due to Mr. George Gwilt, of Southwark.

ICHTHYOSAURUS IN OXON.

SOME workmen, in cutting through a mass of rock at Westbury, near Brackley, came, at the depth of twenty feet, on a layer of clay, in which were found imbedded the bones of an antediluvian monster. By examination of a portion of the jaw containing teeth, and of the joints of the back, it was at once pronounced to be the remains of an *Ichthyosaurus*. In excavating another portion of the line, there were discovered the remains of a fossil fish, which proved to be a fine specimen of the *Lepidosteus*, or bony pike, whose scales are of bone, and which, after being changed by time, have the hardness and look of Ebony. This fish is found now only in the rivers of North America. —*Oxford Journal*.

SILICEOUS ZOOPHYTE. (*Alcyonites parasiticum*).

IN a small slab of agate, from an unknown locality, Mr. Bowerbank observed what he considered the silicified fleshy body of a polyp resembling the Alcyonidium of our coast. From the mammillated surface of the polypidom, several smooth cylindrical tentaculæ project in various directions. From these appearances he conceives that the animal had died quietly, and then been rapidly enveloped in the siliceous matter. To explain the vast quantities of silex which enter into the composition of fossils, Mr. Bowerbank states that there is no occasion to have recourse to thermal springs, or extreme heat and pressure, as is often done; since the amount of this earth set free during the decomposition of various rocks and minerals, and carried by rivers into the sea is fully sufficient for the purpose. The numerous siliceous infusoria found, both recent and fossil, in various formations, prove the abundance of this substance dissolved in the waters of the ocean. This silica in solution appears to have a strong affinity for animal and vegetable matter, and soon collects round and preserves any organic body exposed to its influence.—*Proceedings of the Geological Society.*

TERRIFIC THEORY.

PROFESSOR SILLIMAN mentions the fact, that in boring the Artesian well in Paris, the temperature of the earth increased at the rate of one degree for every fifty feet, towards the centre. Reasoning from causes known to exist, he says :—"That the whole interior portion of the earth, or, at least, a great part of it, is an ocean of melted rock, agitated by violent winds, though I dare not affirm it, is still rendered highly probable by the phenomena of volcanoes. The facts connected with their eruption have been ascertained and placed beyond a doubt. How, then, are they to be accounted for? The theory, prevalent some years since, that they are caused by the combustion of immense coal beds, is perfectly puerile, and is entirely abandoned. All the coal in the world could not afford fuel enough for a single capital exhibition of Vesuvius. We must look higher than this; and I have but little doubt that the whole rests on the action of electric and galvanic principles, which are constantly in operation in the earth."

ERUPTION OF A VOLCANO IN JAVA.

A LETTER from Batavia of the 26th of September, gives some account of a late eruption of Mount Merapia, a volcano in the district of Kadoe, which was believed to be extinct. The eruption began on the morning of the 14th of September during a violent hurricane, and lasted until the evening of the 17th; that is to say, more than three days. The mountain vomited forth gigantic flames and large quantities of stones and ashes. This matter, impelled by the action of the wind, was spread through the whole district of Kadoe and through those of Djokjokarta and Soerakarta. At several points, the soil was covered with ashes to the depth of three inches. The river of Blongkeng was almost wholly filled up, and it is feared that its waters must overflow in the rainy season. The inhabitants fled, and no life was lost; but the loss of property—including crops of rice, tobacco, and indigo, with whole fields of corn—was immense.

EARTHQUAKE DATA.

MR. R. MALLET has communicated to the British Association, a Report on the Statistical and Dynamical Facts of Earthquakes, commencing with a *résumé* of the literature of the subject, and of the past theories of their origin, divisible into two classes—those which attribute them to atmospheric agents, and those which suppose a cause operating beneath the surface. From the consideration of all the existing records, certain propositions were (provisionally) enunciated; and they are given in an abstract of the paper to be found in the *Athenæum*, No. 1143.

EARTHQUAKE WAVES.

MR. MALLET has proposed to the British Association, to ascertain the rate at which shocks communicated to the earth would travel, by

the following method:—A mile is to be measured out on an open country, like Salisbury Plain, by two wires strained on posts like the electric telegraph, and a few pounds of gunpowder buried four or five feet in the ground, at one end of the line, is to be fired by a battery at the other end: the impulse produced by this means would become imperceptible after having travelled to the observer a mile off, unless by the aid of an instrument. Mr. Mallet's instrument is a sort of collimator, consisting of a mercurial trough, with two telescopes, so adjusted, that looking through one of them the reflection of cross wires in the other is seen reflected on the mercury; the slightest vibration passing through the mercury prevents the image from being seen, and the interval between the firing of the gunpowder a mile off and the arrival of the "earth-wave," as indicated by the instrument, is to be obtained by a chronograph attached to the battery,—corrections being made for the time occupied by the passage of the electrical current, the heating of the wire, and the firing of the gunpowder. The author stated that if the elasticity of the earth's crust were known, it would be possible to determine the point from which an earthquake shock originated, and also to form an estimate of the nature of the intervening formations—whether solid or plastic—through depths of perhaps hundreds of miles, and even under the ocean.

COAL FIELDS OF THE ASTURIAS.

IN a letter to Sir R. I. Murchison, M. E. de Verneuil shows, in describing the principal features of the carboniferous rocks of the Asturias (some of the peaks of whose limestones rise to upwards of 8000 feet above the sea), that the chief seams of coal are fairly intercalated with courses of limestone and schists, charged with the well-known British species, *Productus antiquatus*, *P. punctatus*, and various marine fossils. In this and in other overlying stages with conglomerates, &c., containing coal, there is, the author observes, no sandstone or schist which can have served as a soil on which jungle or marsh plants can have grown; and seeing the alternation of the fossil vegetables with marine deposits, he concludes that these coal-fields, like many others, and particularly those of the Donetz in Russia described by Sir R. Murchison and himself, were formed in estuaries of the sea by the transport and subaqueous deposit of terrestrial spoils, and are not referable to the same origin as certain carboniferous strata of the British Isles, America, &c., the coal beds of which are supposed to have been formed of vegetable masses *in situ*. In the second stage of this carboniferous formation, M. de Verneuil discovered, that courses of calcareous schists were loaded with Fusulinæ —a point of very great interest; since these foraminifera have been described in the mountain limestone of Southern Russia, and were subsequently discovered by M. de Verneuil in the carboniferous limestone of the United States of America. Their occurrence at this intermediate station in Spain is, therefore, highly interesting in extending our acquaintance with the uniformity of distribution of animal life in the Palæozoic ages. The coal-fields of the Asturias, (of whi

there are seventy workable seams) seem therefore to be subordinate to the mountain limestone, like those of the north of Northumberland, the south of Scotland, &c. The Devonian system has been found to abound in the north of Spain, chiefly through the researches of M. Paillette, who has transmitted many of its fossils to France, where they have been described by M. de Verneuil.—*Communicated to the Philosophical Magazine*, No. 233.

DISCOVERY OF COAL IN EGYPT.

The *Journal des Débats* publishes a letter from Grand Cairo, of the date of the 1st of August, which announces the discovery, by a French civil engineer, of a stratum of coal in the vicinity of the Nile, towards Upper Egypt. This discovery will relieve the government from the tribute paid to England for the purchase of this indispensable article. Two engineers, an Englishman and a Frenchman, were employed, our readers will remember, to investigate the lands in the vicinity of the Nile, for the discovery of coal, about three years ago; when they reported that there was none, and that none would be found. The French engineer first mentioned, has overthrown this bold assertion.—*Athenæum*, No. 1141.

THE SOUTH STAFFORDSHIRE COAL FIELD.

Mr. J. B. Jukes has communicated to the British Association, a paper "On the General Relations of the New Red Sandstone, the Coal Measures, and the Silurian Rocks, of the South Staffordshire Coal-field;" from which it appears:—1. That the Silurian rocks were upheaved and denuded before the deposition of the coal measures. 2. That there was a movement and denudation of the coal measures, amounting in some localities to their entire destruction and removal, before the deposition of the new red sandstone. 3. That subsequently to the deposition of the new red sandstone, there was a very great movement of all these rocks, producing their present faults and inclined positions. 4. That the boundaries of the South Staffordshire coal-field, as far as examined, present examples of three kinds of relation between the coal measures and new red sandstones, *i. e.* by conformable succession; by fault, the coal measures being present on the downcast side; and thirdly, where the destruction of the coal measures has brought the new red sandstone into immediate contact with the Silurian strata. Whilst, however, there is great hope that the larger part of the new red sandstone plain conceals productive coal measures, there is no probability that these will be found at a depth of less than 500 or 600 yards below the surface.

Sir R. I. Murchison expressed to the Section his belief that at some future time the whole interval between Wolverhampton and Coalbrook Dale would be worked for coal.

Mr. S. H. Blackwell has also read to the Association, a paper "*On the Igneous Rocks* of the South Staffordshire Coal-field;" from *which he concludes*:—1. That the transverse faults must have been *produced subsequently* to the boundary faults and to the elevation of

the Silurian hills. 2. That the direction of these faults is dependent on the central line of elevation. 3. That the great centre of this system is the Dudley-Port trough. 4. That the underground trap of Wolverhampton proceeded from the Rowley Hills, and was injected prior to the formation of the east and west faults, which were probably caused by the withdrawal from beneath the coal strata of the great mass of igneous rocks in the Rowley Hills and Wolverhampton stratum; on the southern side of the field, the downthrows of the coal are also greatest near the large central mass of trap.

Sir H. De La Beche and Mr. Jukes acknowledged the valuable service Mr. Blackwell had rendered to the Geological Survey, by the use of his maps and sections. Prof. Sedgwick remarked on the difficulty of accounting for the injection of such enormous masses of trap rock as were here described, or such as the Great Whinsill of the North of England, by any dynamical means: he also pointed out the difference between these beds, which had evidently been injected horizontally between the layers of strata already consolidated, and other instances in which (like lava-streams spread over the bed of the sea) the trap had been originally uncovered, but had become buried beneath gradually accumulating strata at the bottom of the sea. Mr. Phillips attributed these and other similar systems of faults to movements of elevation and depression taking place subsequently and subordinately to other elevatory movements, by which lines and areas of greater and less resistance were formed; there was no necessity for supposing any sudden or violent action, but only a gradual change in the dimension of a given area in one direction.

NATIVE SILVER IN NORWAY.

It is reported in the Swedish official paper of the 27th October, 1848, that at the King's mine, at Konigsberg, two lumps of native silver, severally 238 and 436 pounds, were obtained within the preceding two months. This mine was offered for sale in London twenty years ago for £10,000, but failed of purchasers. It now brings to the Government more than this sum annually.—*Jameson's Journal*, No. 933.

GOLD FINDING.

In the *Comptes Rendus*, M. Dufrénoy has a very interesting paper on the auriferous sands of several districts, from which, in these gold-seeking days, much valuable information is to be obtained. The gold sands of New Granada collected in the valley of Rio Dolce were found to consist of magnetic and titaniferous iron, zircon, and corundum, with 4 per cent of matter which is described as "opaque yellow, grey rock, probably quartz, iron pyrites and gold. The sands of the Ural mountains contain less of the oxides of iron; and their richness in gold is estimated at 0·00256, while the sands of California are found to give a result of 0·0029.

While the newspapers of Europe and America proclaim the wonders of the new gold region of California, which appears to realize the

of poets, it is not uninteresting to learn that some mineral of this country contain the precious metal. It is well known ie Romans worked the mines of Cardiganshire and Merioneth- or gold; and we gather that East Cwmhesian mine in the latter y has, from a lead lode, recently yielded six or seven pounds of nd that two hundred ounces are now on the surface of the

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GOLD OF CALIFORNIA AND THE URAL MOUNTAINS.

R. I. MURCHISON has read to the British Association, a paper :he Distribution of Gold over the Earth's Surface, and on the are of California, as compared with that of the Ural Moun- ' The extent of this important communication prevents our ing it entire; and we can only quote a few of the leading views. Roderick pointed out the error into which some persons had of supposing that the Uralian mines were worked underground; ly small subterraneous work being one near Ekaterinburg, which a very slight profit. All the other mines along that north and chain, throughout 8° of north latitude, are simply diggings and igs, which are made in the detritus or shingle accumulated on opes of the ridges and in the adjacent valleys, and, with one ex- n, are all on the east side of the range. This phenomenon in ral Mountains is a necessary result of their structure; the older its, through which the eruptive rocks have risen, constituting the crest and eastern slopes of the chain, whilst the western are occupied by deposits of younger or Permian age. As the merates and detritus of the latter rock contain no traces of though they abound in copper ores, it was pointed out in the on Russia, that the auriferous veins were produced after the ac- ation of the Permian system. Comparing California with the Sir Roderick showed that there was a very great coincidence ieralogical structure, and that with these *constants*, the same obtained: the chief distinction consisting in the apparently proportion of gold in the detritus of the newly-discovered de- in California than in those of the Ural. He contended, how- gainst the inference that any large tract of California would be to be as uniformly auriferous as the banks and slopes of the tributaries of the Sacramento. That gold ore has been found atitude 36° to latitude 40° along the western slope of the Sierra a, is admitted, but the longitudinal extension or breadth of the ous detritus of California has yet to be ascertained. As, how- he lower or coast ridge which passes by San Francisco seems in miniature what the higher parallel mountains are upon a scale, in being composed of green stones, porphyries, greywacke ones and quartz rocks, it is probable that very much of the ntervening valley of the Sacramento may be strewed over at in- *with auriferous debris.* And here the author took some pains *ate the distinctions* between all such surface mining operations *of Siberia,* California, and the Brazils, and those works in

which, besides the ores of silver, copper, &c., gold also h tracted from the veins in the solid or parent rock, as in many other parts of the world, and in such cases the nob usually associated with amalgam of other ore, which ren traction very costly. In adverting to the remarkable fac found in superficial detritus the associated ores of the pare have disappeared, he accounted for this phenomenon by t and wear of the other metals, and the resistance of gold quent accompaniment, platinum, to such action, and to tl weight, which had enabled them to withstand the stro former denudation like the quartz veins of the original m

Having terminated his account of the geological con accompany gold mines in Europe, Asia, and America, then traced the history of gold and its development as l ancients and our ancestors of the middle ages. Passing thian or Uralian tract, Sir Roderick stated that it remair and unattended to from the classical age until this cent completely ignorant were the modern Russians of the exis in the Ural mountains, or that they had in their hands which supplied so much gold to Greece and Rome, t German miners had long worked the iron and copper r chain before any gold veins were discovered. These also as solid veins in the rock, for some time before the ac covery of a small per-centage of gold ore in the ancient drift led to the superficial diggings, which produced at less expense ten times the amount of produce of the solid rock near Ekaterinburg. All the energy displayed sian miners having failed to augment the amount of Ural as it has never much exceeded half a million sterling, gradually arriving when the local depressions or basins detritus of that region will be successively dug and was the Ural will then resemble many other countries in poss mines of iron and copper, but merely a history of its go however, has also the golden key of all eastern Siber various offsets from the Altai chain, and chiefly those wh ing the rivers Lena, Jenisei, &c., stretch along the sl Baikal Lake, and have proved so very productive, that fo they have afforded a greater supply of gold (three mill average, exclusive of the Ural) than all the other gold b tries of the world.

As in the Ural Mountains, so in California, notwithst keen scent for gold from the days of Columbus to the p the Spaniards never knew of its existence in the valley o mento, which tract they left in quiet possession of the nat and it was only by the recent accident of the breaking aw of detritus by a mill-race that this region was opened out time to the new colonists of the Anglo-Saxon race. to be the value and duration of these Californian m point of absolute value the author does not venture,

fficient facts and statistical data; but in regard to the duration of e mining ground of California, he speculates that if it be locally so much richer than the similarly constituted detritus in the Ural, still there is nothing to interfere with the belief founded on all past experience, that with the activity now employed in the works they may not be neglected or abandoned in a given time. The very great per-centage of gold ore in the valleys of the Sacramento seems to indicate that the most valuable portions of the original veins have been ground down by former powerful denuding agencies; and as the rule obtains very greatly in mining, that the richer the veins the less are they likely to be spread over a large mass of parent rock, so is he disposed to think that it will only be in certain patches that very great wealth will be discovered: and hence that it would be hasty to conclude that because rich gold detritus has been discovered near the sources of the Sacramento in latitude 40°, and also on the river Colorado in latitude 4° 5′, that all the intermediate tract of country (of 4 degrees of lat. and 1 of long.) should prove equally productive.

Considering the vast addition in the few last years of nearly four millions sterling per annum made to the European market by the researches in Siberia, and seeing how little effect such addition has produced in the value of gold, the author is of opinion that the Californian discovery is not likely to produce any material disturbance in the standard. At the same time, he expresses his full agreement with M. Erman and others, that with the advancement of colonization in the central regions of North Asia and other parts of the world where civilization has not yet extended, other gold tracts may be discovered wherever the geological and lithological constants to which he has adverted occur; but neither would this circumstance induce him to fear that such discoveries (which can only take place at long intervals of time) will more than compensate for the wear and tear of the precious metal, and supply the wants of the rapidly increasing population, and more highly advanced state of civilization.

Sir Roderick reminded his geological auditors, that in considering the composition of the chief or eastern ridge of Australia and its direction from north to south, he had foretold (as well as Colonel Helmersen, of the Russian Imperial Mines) that gold would be found in it, and he stated that in the last year one gentleman resident in Sydney who had read what he had written and spoken on this point, had sent him specimens of gold ore found in the Blue Mountains; whilst from another source he had learned that the parallel north and south ridge in the Adelaide region, which had yielded so much copper, had also given undoubted signs of gold ore.

In conclusion, the author observes: A periodic discovery like that of California may, indeed, in the hands of adventurous and unbridled speculators, force a considerable quantity of surface gold so suddenly upon the market, that a momentary apprehension of a great change in its relative value may be entertained; but looking to the mineralogical *and geological* structure of America, and seeing how large a *portion of that continent* is made up of rocks precisely similar to

those which have afforded the gold shingle and sand of the Sacramento, and knowing that all the other far-famed gold districts of the New World have had assignable limits in their productive capacities, and that many of their sources have disappeared or become valueless, —he believes that the time will come when the rich soil of the valleys of California, like that of the banks of the Rhine, the Guadalquivir, and the rivers of Bohemia, will alone be turned up by the plough, or serve as pasture lands, to the entire abandonment of gold hunting.

An interesting discussion followed, in which the President of the Section confirmed the statement of Sir R. Murchison,—that little advantage had ever been gained by mining the solid rocks containing gold. Prof. W. Rogers stated the position and the relations of the gold ore in the United States: he is of opinion that, after a few years, the amount of gold obtained in California will greatly decline, without having inundated the world to such an extent as had been expected. Prof. Sedgwick described the manner in which the tin ore is separated from the alluvial soil in Cornwall, by "jigging," or agitating it in a basket with water, by which the soil is washed away and the heavier ore remains; it was by a similar process, carried on upon a large scale, that nature formed the Californian gold-field; the Sierra Nevada had been agitated beneath the waves of the sea until thousands of feet of solid rock had been broken up, the lighter and more soluble materials carried far away, and the heavy particles of gold spread out with the detritus remaining in the valleys immediately below the hills. Such deposits could not be uniformly rich, and the most productive would probably be first discovered; there was no fear, however, of obtaining too great a quantity of gold,—the population of the world was increasing, and for whatever purposes gold was useful a larger quantity was required. Sir H. De la Beche also argued, that the mineral and physical conditions, rather than the age of the rock, were connected with the accumulation of any particular ore. Mr. C. Darwin stated that he had visited a gold mine on the east side of the Cordillera, in rocks much newer than the Neocomian series; the mines were poor, but the comparatively modern origin of the rocks was indubitable. Sir R. Murchison, in reply, observed that he believed all *rich* gold veins were confined to the older Palæozoic rocks, but his observations did not relate to the occurrence of minute quantities.

DISCOVERY OF GOLD AT PORT PHILLIP.

In the Melbourne *Argus*, of March 31, 1849, we find described the discovery of an extensive gold field in the province of Port Phillip. A shepherd found the first specimen, and with a Mr. Duchene proceeded to the spot, in the neighbourhood of the Pyrenees, and found indications of the metal in great abundance, and extending over a great space. He returned to Melbourne with ore sufficient to yield £100 worth of pure gold. He describes the gold as being abundant, and the quality as better than any he has hitherto seen worked. The quantity contained in the mine visited by them was incalculable;

rs, there is a tract of territory at least five miles in extent shes everywhere abundant indications of the existence of Duchene picked up one piece of the metal weighing 2 lb. ı contained upwards of 90 per cent. of virgin gold; in fact, l the appearance of a lump of molten gold, interspersed quartz pebbles. This extraordinary news has produced ıia throughout the Port Phillip district. The quality of the vever, questionable.

Roberts, of Asgrove, Van Diemen's Land, writes in the *Examiner*:—"From communications, I have no doubt of ce of perhaps the richest gold mine in the world at Port ; at present appears to be a diluvial deposit, aided by an of the earth. How long this gold mine has existed it ılly to surmise, but the lapse of ages must have occurred rmation of the Pyrenees; and it follows, the *washings* of ins must have caused at the foot of mountains very con- posits. I believe the gold at California was discovered by of a mill-dam, by a gentleman named Sutter; and I have on *good authority*, that the gold deposits at California are ght feet from the surface, and it is said the whole surface Will it, therefore, not be wise in some of the settlers ıe foot of the Pyrenees to bore some ten to twenty feet? d not Port Phillip have beds of gold dust as extensive as since gold has been found in pieces as large as from one to d a half ounces? I copy this weight from a letter from a who says he has had the pieces in his hand, and that one ıad procured as much as *eight pounds!*"

BRITISH GOLD.

ıious and interesting discovery has been made in the mani- metalliferous substances, by which an alloy is produced ıly to come into very general use for numerous articles ınufactured in gilt work, or molu, and other more expensive ; is a mixture in certain proportions of copper, tin, zinc, tly homogeneous, close in texture, highly ductile, rolls into is manufactured with the greatest facility. It can be had tints, to represent gold of different degrees of colour and ıs a high degree of polish, and cleans easily when tarnished. ınspected some small articles, pencil-cases, &c., manufac- this alloy, and it would indeed be difficult for the most ye to discover they were not gold, without having recourse test, or ascertaining the specific gravity, which is, of course, ıe precious metal.—*Mining Journal.*

COPPER OF LAKE SUPERIOR REGION.

T. JACKSON states:—"The native copper mines of this re- *uly wonderful*, both for the quantities that are exposed in *and the* magnitude of the masses of native metal. Truly *per veins.* I have seen the most noble lumps in this

place, and one has been lately blown off in stopping the Cliff mine, Eagle River, that will weigh 50 tons. It is now cutting up into pieces of two or three tons weight, so that it may be sent to market. The supply furnished by that mine is as regular as it is in most mines furnishing ore. This spring the miners had 400 tons on hand, and they have sent down to Baltimore 600 tons at this time; and they estimate the amount of copper that they will ship at from 900 to 1000 tons before the close of navigation in November next. This mine has been wrought with proper energy, and will richly repay the owners. There are several other native copper mines here that are equally promising, and will produce well when wrought with proper energy and skill. Copper Falls mine is an example, and is doing well. The north-west is another full of promise, and I have seen others which look very rich, but which are not yet opened deep enough to exhibit their contents. The shafts at the Cliff mine are 205 feet deep, and the hill above shews the vein in the face 213 feet higher, so that we know that the copper extends at least 418 feet. Those who were surprised that I recommended working mines for native copper, should come and see, and they would believe. The case is indeed a new one, and we watch with interest the results. Native silver is found mostly at and near the junction of the trap and sandstone where the veins end, not passing into the sandstone."—*American Journal of Science and Arts*, March, 1849.

COALS IN THE NEW WORLD.

In Vancouver's Island, the North-Eastern coal district is worked so near the surface, that at the port of Camosack, the steam sloop *Cormorant* has been supplied by the natives with sixty-two tons of coal within three days. Specimens of this coal have been examined for the Admiralty; and although it yields a considerable per-centage of ash, it is not much inferior to the coal of South Wales. In addition to this, the coal-field of Chili is found to produce a fuel in many respects not inferior to the coal of Newcastle. These and the more recent discovery of coal at Port Famine ensure the success of steam navigation on the Pacific Ocean: and the mineral wealth of the whole of the American coast, ranging from Chili to California, with its vast treasures of copper—much of which is already smelted in Chili,—lead, silver, and gold, will be rendered available for the wants of an increasing population,—and give rise eventually to flourishing communities along the shores of the Western Ocean.—*Athenæum*, No. 1110.

Astronomical and Meteorological Phenomena.

NEW PLANET.

A LETTER has been read to the Astronomical Society, from Signor ırpellini, announcing the discovery of a New Planet (probably one :he group of asteroids) by Signor Annibale Gasparis, at Naples, on 12th of April. It appeared as a star of the 9·10 magnitude, and ; known to be a planet on the 14th by its motion. Its approximate ces on the 14th and 17th, by comparison with the star 23098 of English edition of Lalande, were as follows :—

1849.	Greenwich M.T.	R.A.	N. P. D.
April 14	8h 5m 53s	12h 11m 50s	97° 28
„ 17	13 5 42	12 9 21	97 13

PERTURBATIONS OF THE PLANETS.

M. LEVERRIER has for some time past been engaged in making a nplete revision of the calculations relative to the Perturbations of Planets :—commencing with those on the perturbations in the vements of the Sun, as the basis of all the others. In the course his labours he arrived at what he calls "*un résultat tout à fait ttendu :*"—which he has communicated in the following terms to Paris Academy of Sciences—

' The action which the planet Mars exercises over the Earth, is not what rould be if the planet Jupiter did not exist. Mars, in fact, is displaced by action of Jupiter,—and this displacement causes another in the position the Earth. The perturbatory action arising thus in a secondary order m the indirect influence of Jupiter by the intermediary of Mars, is neces ily very little. But in given circumstances it may preserve for centuries same effect, which, accumulating with time, would end by becoming sible ; inasmuch as three times the movement of Jupiter, increased by r times the movement of the earth, would give an amount very nearly ıal to eight times the movement of Mars ;—and there results in the movent of the Earth, or, what amounts to the same thing, in the movement of Sun, a variation inferior to all known variations, being in its maxima m 14 to 15 seconds of a degree. It would, however, be developed with at slowness. It is the slowness of the development which hitherto has de the employment of the perturbation not indispensable; but it will bee more and more sensible with time, and its omission would render imsible an exact theory of the movement of the Sun. It is especially in the cussion of the old passages of inferior planets on the Sun, compared t ıre passages, that it becomes indispensable to consider the action here icated."

SUPPLEMENTARY SATELLITE OF URANUS.

IN the report of the labours of the Astronomers for 1847-8, preıted to the Academy of Sciences of St. Petersburgh, it is stated in : words of M. O. Strüve, that the existence of the Supplementary ıellite of Uranus appears put beyond a doubt ; and he says, " forıately Uranus is elevated each year more and more above the equa- *; and I hope that, if* the other satellites suspected by Herschel *'/y exist, they will* not long escape the eyes of astronomers."

LAWS OF ATMOSPHERIC PHENOMENA.

Among the most important investigations of our own time, we must assign a prominent place to those connected with Meteorology. We may reasonably expect within a comparatively short period to ascertain the laws by which Atmospheric Phenomena, hitherto regarded as the emblem of inconstancy, are regulated. Observations of the most accurate kind are now made at all the magnetic and astronomical observatories in every part of the world; and the reduction and full examination of these have been made by Prof. Dove. In a series of Memoirs presented to the Academy of Sciences at Berlin, this investigator has most industriously determined the progression of atmospheric temperature during an interval of 115 years—from 1729 to 1843. It is impossible for us to give any idea of the amount of labour of the most severe description which is bestowed on this examination,—of the great variety of interesting facts embraced in these Memoirs. It must suffice to state that the gradual passage of the *isothermal lines* of January and July into one another, exhibits over the century the utmost regularity.—*Athenæum.*

MECHANICAL EQUIVALENT FOR AURORAL ACTION.

Mr. E. Highton has communicated to the British Association, a paper "On an Approximate Mechanical Equivalent for the Auroral Action of the 17th and 18th of November, 1848. During this aurora, the electric telegraph at the Watford Tunnel was violently affected for many hours; the climax occurring at 3 o'clock A.M on the 18th. The wires extend in the tunnel about one mile and seventy yards, and are exposed outside the tunnel at both ends for three-quarters of a mile. The indicators frequently flew from one side to the other during the display, and often remained permanently deflected for a considerable time at once. On several occasions, the electric current passing was sufficiently powerful to attract the moveable armature of the stationary electro-magnet of a bell apparatus, so as to allow the alarum to be sounded. Mr. Highton found by direct experiment afterwards that a pressure of one-third of an ounce was required to produce this effect. Then, by a simple calculation from the length and thickness of the wires, he calculates that 180 superficial feet of wire were exposed at the ends; and hence he comes to the conclusion that the auroral power, if similarly extended over a square mile of surface, would be equivalent to the lifting of seventy-five tons. But if it be contended that the entire wire in the tunnel was affected as well as that exposed outside, he then finds that the force over a square mile would be upwards of thirty-one tons.

CAUSE OF THE AURORA BOREALIS.

Mr. W. Sturgeon has communicated to the Royal Institution, Manchester, "A Description of several extraordinary Displays of the Aurora Borealis, as observed at Prestwich, during the winter of 1848-*1849; with* Theoretical Remarks;" which the author concludes with *this observation* :—

"I perfectly agree with Halley, Hansteen, Brewster, and many other eminent philosophers, in the belief of a magnetic element or effluvium pervading the atmosphere, and perhaps all space; but the principles of electro-magnetism do not allow of electric currents traversing the magnetic lines of force in the direction of their length, unless constrained by other influences than any known to exist in the regions of the aurora borealis."

CLIMATE OF ITALY.

M. Dureau de la Malla closes an elaborate investigation into the Climate of ancient Italy, with the conclusion that the limits for different agricultural products were the same in the earlier as in the more recent periods; and that from the time of Augustus till the present, there has been no sensible modification of temperature, either as regards the months or years.—*Jameson's Journal*, No. 93.

LUMINOUS METEORS.

Mr. W. R. Birt has communicated to the *Athenæum*, the following:—

At about a quarter past 10 P.M., August the 10th, 1849, a very splendid Globular Meteor, about the size of Jupiter, at opposition, of a whitish colour, very slightly tinged with red, passed over γ Pegasi—*i. e.* the star, meteor, and eye were in the same right line. Its path, which was curved, was nearly parallel to the horizon; and it increased in brilliancy as it proceeded, until its disappearance, which could not not have been far removed from the line joining α and β Pegasi, and produced. γ Pegasi was about mid-way of its apparent path. The path suggested the idea of that of a projectile sensibly bending to the earth, or rather horizon, just before the disappearance. There was no train; and the meteor was exceedingly unlike any that had been observed during the same evening, which were of the ordinary character; three leaving long trains of reddish scintillations. These scintillations were more intense in the middle of the meteor's path, dying away at each extremity. Within a very short interval, which the writer estimated at less than a minute, another meteor of precisely the same size, and exhibiting precisely the same characters in every respect, not one excepted, appeared just beyond the point of disappearance of the previous one. Its path appeared to be a prolongation of that in which the first moved; and it disappeared in exactly the same manner, slightly bending to the horizon not far from β Aquarii. Assuming for a moment—what is not altogether improbable—that the two were only one meteor, which by some means became extinguished for a short time during its course, its visible path in the heavens at London would be at least from 15° north dec. 0° right asc. to 6° south dec. 320 right asc. *retrograde*,—and it crossed the equinoctial about 332° right asc.

Prof. Powell has submitted to the British Association, an extensive collection of facts collected from numerous observers, forming a continuation *of the report on* Luminous Meteors drawn up last year by

him, at the request of the Association. In each case, the exact cumstances attending each meteor were given accurately, frequenth seen in several places at the same time; the periods of showers meteors at given times of the year were given in some instances fi separate observations. Meteors seen by day passing between the server and the earth, were in some cases recorded; these were s posed to be in some instances the cause of unusually cold days. Tl which were suddenly extinguished, as if being previously illumin by the sun, and at an instant ploughing into the shadow of the ea were much attended to as giving assistance to the researches of John Lubbock and other investigators of this subject. Continuat of the same subject were presented by Mr. Lowe and Mr. Birt.

METEOR IN THE UNITED STATES.

A Meteor, brighter than the planet Venus, was seen by Mr. B from the Observatory at Cambridge (Mary-land), on Sunday even July 17, at 9h 12m. Its middle course, which was without appa curvature, bore about East. At first the meteor was seen in the shoulder of Antinous, near the star Eta Aquillæ. It was then brighter than a star of the fifth magnitude—increased gradually du the first half of its visible course, and during the latter part rapidly; passing over about fifteen degrees, and fading from the near the star Epsilon in the Dolphin. When near the apparent mination of its course, a large fragment was detached or thrown which seemed at first just to lag behind for a moment, and the keep pace with the principal mass. Other smaller fragments also separated, which also followed in the train. The colour white, slightly tinged with orange; and it resembled a mass o tensely heated iron. All the appearances were satisfactorily determ —*American paper.*

FIRE-BALL AT BOMBAY.

On the evening of Monday the 19th February, about half-pa o'clock, just as the sun had set, and twilight was yet strong, a nificent Fire-ball was seen to shoot across the island from south to north-east, and burst over the mountain range beyond. It w large, so luminous, and so rapid in its movements, that it appea many as if within a hundred feet or so of the ground. It was most beautiful greenish-white, of dazzling splendour; on burstin fragments were of a strong, rather darkish, red. It was seen ov whole of the island of Bombay, and at almost every intermediate for some 300 miles into the interior. It appears to have been great elevation, and, as suggested by a Poonah corresponden probably some hundreds of miles from the nearest spectator who perceived. The volume of the mass, the length of its course, an velocity with which it rushed along, may from this be imagined above observed, when first seen at Bombay it appeared as if over the dockyard; in this all the observers who noticed it in parts of the island concur. At Poonah, lat. 80° 30' N., l

E., it was observed at a quarter-past six at the altitude of about 30°; it was visible from Poorundhur, twenty-six miles east of Poonah. It was observed at Aurungabad, lat. 19° 45′ N., long. 75° 30′ E., as if to the south; and from Sholapore, lat. 17° 14′ N., long. 76° E., where its appearance was most carefully described as seen in a north-easterly direction. It was also carefully observed at Surat, 21° 11° N., 73° 7′ E. It has thus been described as visible over an area of above 3° of longitude and 2° of longitude—from Bombay, 18° 53′ N., and 72° 49′ E., to Sholapore and Aurungabad; though in all likelihood it may have been observed over a much more extensive area than this, from which as yet no observations have reached us. From the explosions heard at Aurungabad it is possible that in this neighbourhood it burst.

It is inferred that the above meteor was not visible much beyond an area of 300 miles, north and south, and as much east and west, or 90,000 square miles in all. The western margin of this space, for about 30 miles, is a little above the level of the sea; the eastern portion, for about 250 miles, varies in elevation from 1900 to 2000 feet. *Bombay Monthly Times.*

LARGE HAIL-STONES.

In a paper read to the British Association, Dr. Buist considers that the storm was felt all over India; and amongst other places where it fell severely, he mentions Lanlua in the Deccan, where, on the 14th of January, 1849, there was a hail-storm, the hailstones being lenticular, and from two to two and a half inches in diameter, and weighing from one to two ounces each!

BLACK RAIN IN IRELAND.

Professor Barker has submitted to the Royal Dublin Society, a bottle, containing a portion of Black Rain, which had been transmitted to him from Carlow, accompanied by a letter, in which the writer mentioned that at the time of its collection it was uniformly black, and resembled ordinary writing ink; but he (Dr. Barker) found that, after allowing it to stand for a short period, the black colouring matter separated from the water with which it had been mixed, rendering the colour of the rain much lighter than at first. The places in which this phenomenon occurred were Abbeyleix, Carlow, Kilkenny, and Athy; from which it would appear that the black shower had extended over an area of more than 400 square miles. As far as he had been able to ascertain, it occurred about six o'clock in the evening of April 14th, being preceded by such extreme darkness that it was impossible to read except by candle-light. After this darkness had existed for some time, a hail storm, attended with vivid lightning, but without thunder, occurred, and when this subsided, the black rain fell. It was mentioned by his Carlow correspondent that upon examining a quantity of this rain just after it had fallen, he found it had an extremely fœtid smell and a very disagreeable taste, that it had left a stain upon some clothes on which it had fallen, and that cattle refus

to drink it. At Abbeyleix and Athy, where the shower descended at the same moment, the appearance of the rain was precisely similar to that which fell in Carlow; but it was unaccompanied by the lightning which had been observed at the latter place.

FALL OF RED RAIN.

A SHOWER of Rain, as red as blood, has fallen near the village of Bonvilstone, and extended thence in a westerly direction over Llantrithyd, Flemingston, &c., towards Lantwit-Major. It was so manifest that it impregnated the clods of earth, many of which were like ruddle. Several country people who witnessed it were dreadfully alarmed, imagining it to be some omen of coming misfortune; and many, who did not see it fall, came in the course of the day to see the discoloured soil.—*Cambrian.*

RAINBOW AFTER SUNSET.

PROF. CHEVALIER has stated to the British Association, that, being at Esk, near Durham, on July 1, 1849, he observed a Rainbow, which continued to be visible after the setting of the sun's complete disc. The latitude of the place has been determined accurately by Bessel's method of observing the transit of stars over the eastern and western prime vertical; and assuming the horizontal refraction to be 33′, the time of the setting of the sun's upper limb was 8h. 36m. 2s. The time of sunset could not be observed in consequence of clouds. At 8h. 31m. 43s. the bow seemed to be a portion of a circle greater than a semicircle, like a Saracenic arch, both the northern and southern portions being visible to an altitude of about 40°. At 8h. 34m. 43s. the southern end had faded, but the northern end a part of the secondary bow were visible at about 5° of altitude, the sky being visibly darker between the primary bow. This continued visible till 8h. 37m. 48s., 1m. 48s. after complete sunset; and as late as 8h. 38m. 43s., 2m. 41s. after sunset, an irregular portion of the bow was visible at an altitude of about 45°. The time was accurately known by comparing the watch with a transit clock immediately after the observation. In order to account for this appearance, it must be supposed either that the horizontal refraction was much greater than usual, or that the bow was formed at a very elevated region of the atmosphere.

RAINY DAYS.

IN general the number of rainy days is greatest near the sea, and decreases in proportion the further we penetrate into the interior. On the eastern side of Ireland, it rains on 208 days; in the Netherlands on 170; in England, France, and the north of Germany, and in the Gulf of Finland, on from 152 to 155 days; on the plateau of Germany on 131; and in Poland on 158 days; while on the plains of the Volga, at Kasan, it rains on 90; and in the interior of Siberia, only on 60 days in the year. In Western Europe, it rains on twice as many days as in Eastern Europe; in Ireland on three times as many days as in Italy and the south of Spain.—*Johnston's Physical Atlas.*

PRODUCTION OF LIGHTNING BY RAIN.

Mr. W. R. Birt, in a paper communicated to the *Philosophical Magazine*, No. 235, says—

On the 26th of July, 1847, a severe thunder-storm, accompanied by the destruction of property, and the loss of human life, passed over the metropolis. About 1h. 30m. P.M., the clouds towards the north-east presented a very dark and threatening aspect; they assumed an inky colour, and the velocity of their motion was very slow; in fact, the appearance noticed was strikingly of that character which the writer had frequently observed to precede a thunder-storm. On this occasion, his attention was more particularly directed to the connexion between the electric discharge, and the sudden gush of rain that more or less accompanies it, with a view to illustrate the question occurring in the Report of the Committee of Physics, approved by the President and Council of the Royal Society,—Is this rain a *cause* or *consequence* of the electric discharge?

In this paper, the author details the circumstances under which a house in West Street, Whitechapel, was struck. We have only room for the conclusion:—

"The discharge at 2h 5m P.M., was, as we have already observed, preceded by a gush of heavy rain; and taking the suggestion in the report alluded to above into consideration, there appears to be great probability that the formation of the lightning was in accordance therewith. For upwards of half an hour violent meteorological action had taken place, the precipitation of rain being very prominent. There can be no question that this precipitation was accompanied by well-marked electrical phænomena; and when, as at 2h 5m P.M., an increased but sudden precipitation occurred, it is likely that an agglomeration of the smaller drops took place, increasing, as suggested, the electric tension to such an enormous extent, that a flash escaped *in the immediate neighbourhood of the houses struck*; and when we consider that at the time several millions of drops must have been falling, each contributing its quota to the general result, it is not to be wondered at that the tension of the electricity was so great as to produce the very violent effects witnessed."

Mr. T. H. Dixon, of Leeds, in a letter in the *Philosophical Magazine*, No. 237, states that on the evening of June 4, 1849, a very severe thunderstorm visited Leeds and the neighbourhood, beginning about 9 P.M., and continuing until 12, but the rain did not begin till 11. The whole of the shower which followed was characterized by the wave-like intensity of the falling rain; first, the shower began very violently, and gradually got less intense until succeeded by another sudden increase, and during the whole storm this increase and decrease could be distinctly marked. Mr. Dixon also noticed a similar circumstance at Redcar in July, and can most certainly bear witness that in many instances the increase of rain preceded the flash of lightning; *and this occurred* many times in succession. If from observation, *says Mr. Dixon,* we find the rain during thunderstorms has this peculiar *characteristic,* we may safely consider that rain has something to do *with the production* of electricity.

PROGNOSTICATIONS OF THE WEATHER.

MR. LOWE, of Nottingham, has published a pamphlet, with the above title; which contains the following table,—showing, of many registered observations, how many went each way :—

	No. of Observations.	Followed in 24 h. by Fine.	Followed in 24 h. by Rain.
Solar halos	204	133	71
Lunar halos	102	51	51
Mock suns	35	19	16
Mock moons	9	7	2
White stratus in the valley	229	201	28
Distance clear	102	61	41
Distant sounds heard as if near at hand	45	25	20
Aurora borealis	76	49	27
Lunar burr	64	47	17
Coloured clouds at sunset	35	26	9
Black stratus	6	3	3
Burr round Venus	6	4	2
Whirlwind	4	4	0
Dew profuse	241	198	43
Dew from 1st April to 30th September	185	161	24
Dew from 1st October to 30th March	56	37	19
White frost	73	59	14
Falling stars abundant	85	65	20
Stars bright	83	64	19
Stars dim	54	32	22
Sun pale and sparkling	51	27	24
Smoke rising perpendicularly	6	5	1
Moon shining dimly	18	12	6
Sun red and shorn of rays	34	31	3
Stars scintillated	14	12	2
Moon rose of a red colour	8	7	1
Sun shone through thin cirrostrati	13	6	7
Bats flying about in the evening	61	45	16
Many toads in evening	17	12	5
Many snails about	29	15	14
Fish rise much in the lake	15	9	6
Bees busy	29	19	10
Many locusts	8	4	4
Cattle restless	24	12	12
Landrails clamorous	14	13	1
Flies troublesome	22	12	10
Gnats troublesome	28	15	13
Many insects	24	13	11
Crows congregate and are clamorous	34	18	16
Spider webs thickly woven on the grass	13	9	4
Spiders hanging on their webs in evening	8	5	3
Ducks and geese clamorous	10	7	3
Cabbages and turnips lowering	25	5	20

In the above table it will be seen that fine weather predominates even in the prognostications for rain. That there are a greater number of fine days than there would be if we were to register the day rainy, if followed by a slight shower, is owing, in a slight degree, to the day being called fine, unless sufficient rain has fallen to allow of *its being* measured in the rain gauge.

METEOROLOGY OF 1849.

Results deduced from the Meteorological Register kept at the Royal Observatory, Greenwich, during the year 1849, *under the Superintendence of the Astronomer Royal.*

Months.	Mean Reading of Barom.	Mean Tension of Vapour.	Mean Pressure of Dry Air.	Temperature of Air. Self-Reg. Therm.	Therm. Dry Bulb.	Adopted.	Highest.	Lowest.	Range.	Mean Daily Range.	Temperature of Evap.	Evap. below Air.	Dew Point below Air.	Dew Point.	Rain. No. of Days.	Amount in Inches.	Weight of Vapour.	Add. Weight.	Degree of Humidity.	Weight of a cubic foot of Air.
	In.	In.	In.	°	°	°	°	°	°	°	°	°	°	°		Ins.	Gr.	Gr.		Gr.
Jan. ..	29·771	0·293	23·538	40·1	40·1	40·1	56·4	19·9	36·5	10·8	38·6	1·5	3·7	36·4	17	1·6	2·7	0·4	0·843	548
Feb. ..	30·100	0·255	29·845	43·0	43·2	43·1	58·0	23·5	34·5	12·9	41·4	1·8	4.3	38·9	10	2·2	3·0	0·5	0·863	550
March.	29·915	0·230	29·685	43·0	42·5	42·8	60·0	27·7	32·3	13·8	39·8	2·7	6·4	36·1	8	0·5	2·7	0·7	0·801	548
April..	29·517	0·256	29·261	43·2	43·3	43·2	64·3	26·8	37·5	16·0	41·5	1·8	4·2	39·1	19	2·2	3 0	0·5	0·864	540
May ..	29·766	0·303	29·463	53 6	54·2	54·0	75·0	36·4	38·6	16·3	49·0	5·2	10·0	43·9	15	3·9	3·4	1·5	0·703	532
June..	29·868	0·354	29·514	57·1	58·4	57·9	80·7	38·6	42·1	20·6	53·0	5·4	10·3	48·4	5	0·2	4·0	1·6	0·715	529
July ..	29·789	0·398	29·391	61·0	62·1	62 1	84·1	39·5	44·6	22·6	56·2	5·9	11·0	51·1	12	2·9	4·5	1·7	0·711	524
Aug...	29·841	0·417	29·424	62·4	62·8	62·9	82·5	42·4	40·1	20·2	57·3	5·5	9.5	53·3	3	0·5	4·7	1·8	0·772	523
Sept...	29·767	0·387	29·380	58·7	58·8	58·8	79·0	42·7	36·3	17·5	54·6	4·2	7·7	51·1	15	3·3	4·4	1·3	0·772	527
Oct. ..	29·744	0·316	29·428	50·7	51·1	51·1	69·7	31 5	38·2	15·1	48·2	2·9	6·0	45·1	21	2·7	3·6	0·8	0·815	534
Nov...	29·743	0·263	29·480	43·6	44 1	44·1	61·7	23·5	38·2	11·7	42·2	1·9	4·3	39·8	11	1 5	3·0	0·5	0·860	543
Dec. ..	29·795	0·223	29·572	39·0	39·1	39·1	56·3	18·8	37 5	9·1	37·9	1·2	4·0	35·1	17	2·4	2·7	0·3	0·903	550

EXPLANATION.

The cistern of the barometer is about 159 feet above the level of the sea, and its readings are coincident with those of the Royal Society's flint-glass barometer. The observations are taken daily at 9 A.M. noon, 3 P.M., and 9 P.M.; the means of these readings are corrected for diurnal ranges by the application of Mr. Glaisher's corrections as published in the *Philosophical Transactions*, Part I., 1848, and from th readings of the dry and wet bulb thermometers, thus corrected, the several hygrometric deductions in columns 3, 15, 18, 19, 20 and 21, are calculated by means of Mr. Glaisher's Hygrometric Tables.

The numbers in column 2 show the mean reading of the barometer every month, or the mean length of the column of mercury which balanced the whole weight of atmosphere of air and water; the numbers in column 3 show the length of a column of mercury balanced by the water mixed with the air alone; and the numbers in column 4 show the length of a column of mercury balanced by the air alone, or that reading of the barometer which would have been had no vapour been mixed with the air.

[*Concluded on next page.*

The numbers in columns 5 and 6 are determinations of the mean temperature of the air by different instruments and methods—those in column 5 by the readings of self-registering thermometers daily, and those in column 6 by the readings of a simple thermometer taken at the times before mentioned. The numbers in column 7 show the true temperature of the air in every month, those in column 8 the true temperature of evaporation; and those in column 15 the true temperature of the dew point, or that temperature at which the vapour in the air is deposited in the shape of water.

The mean reading of the barometer for the year was 29·801 inches; the mean temperature of the air for the year was 49°·9; that of evaporation was 46°·6; and that of the dew point was 43·2. Rain fell on 153 days, and the amount collected was 23·9 inches.

Till January 7, between March 18 and April 28, from June 6 to June 28, from July 18 to Aug. 5, Aug. 13 to 19, Sept. 11 to 21, Oct. 1 to 16, and after November 18, the temperature of the air was below its average value, and it was mostly above at other times.

The reading of the barometer during the month of February was very unusual: the average reading of the barometer at Greenwich, from Feb. 1 to the 18th, was 30·36 inches, which was fully half an inch above its average value. This denotes an increase in the volume of air of about 1-60th part above the usual quantity; on the 11th day the very unusual reading of 30·715 inches took place: this reading denotes that there was about 1-30th more than the usual amount of air over England on this day. This reading, reduced to the level of the sea, is 30·91 inches. In December 1778, the reading at the level of the sea was 30·90 inches; and in January 1828, at the same level, it was 30·92 inches.

Thunder-storms occurred on January 10, at Whitehaven; on January 14, at Norwich; on February 25, at Truro; on March 31, at Uckfield; on April 28, and May 2, at Stone; there were several in May and June, and many in the quarter ending September; at Liverpool on Nov. 14; and at Stonyhurst on Nov. 6.

Snow fell at different parts of the country on Jan. 4, 5, 29, Feb. 28, March 24, 25, 28, and 31; and at various places on April 13, 16, 17, 18, 19, 20, and 21; on Oct. 3, 4, Nov. 6, 7, 15, 27, 28, 29, Dec. 4, 5, 12, 19, 21, 22, 24, 27, 28, 29, and 30. The first snow which fell in London was on Dec. 21.

Auroræ Boreales were seen on Jan. 14, 15, Feb. 18, 19, 20, 21, 22, 23, Mar. 31, May 31, June 15, 26, 30, Aug. 18, Sept. 3, 16, Oct. 15, and 22.

First frost, at Shap, Oct. 3; at Hartwell, Oct. 9; London, Nov. 27.

The summer was warm and dry, without great heat; the autumn was distinguished by a very unusual prevalence of fog. For additional particulars, see Mr. Glaisher's Reports upon the weather, in the *Philosophical Magazine*, and in the Quarterly Reports of the Registrar-General.

AERIAL CURRENTS.

Arrangements have been made to insure a daily return of the prevailing winds over every portion of this island to which the Railroads or Electric Telegraph have been extended. The importance of this must be evident to every one who has made meteorology the subject of attention; as these returns may in all probability serve to establish the law of the progress of great Aerial Currents, and of the disturbing influence of peculiarities in the form of the earth's surface. M. Quételet has communicated to the Royal Academy of Sciences of Belgium some particulars relative to the arrangements in England; and he states that a series of analogous observations have been made at Brussels, Ghent, Louvain, St. Trond, Liége, and Namur. We may hope that they will be extended to the extreme stations of Ostend, Antwerp, and Verviers, and gradually be carried on over a much larger extent of the continent of Europe.

Obituary

OF PERSONS EMINENT IN SCIENCE OR ART. 1849.

EDWARD FORSTER, Vice-President of the Linnæan Society.

CAPT. W. SIBORNE, constructor of a Model of the Battle of Waterloo.

JAMES MORIER, the traveller in the East.

CARDINAL MEZZOFANTI, linguist.

MAJOR SHADWELL CLERKE, traveller and geographer.

DR. STEPHEN ENDLICHER, Professor of Botany at Vienna.

MARSCHAL BORRELLI, the first who applied geometry to the movements of animals.

THOMAS WRIGHT, engraver.

VAN ALSTEN, chemist.

DR. ANTHONY TODD THOMSON, Professor of Materia Medica in University College, London.

JACOB PERKINS, inventor of engraving on steel.

ANDREW BELL, philosopher and mathematician.

HENRY COLMAN, the American agriculturist.

ASTON KEY, the distinguished surgeon.

FRANÇOIS PHILIPPAR, founder of the Botanic Garden at Versailles.

JEAN-MARC BOURGERY, author of the great French work on "The Anatomy of Man."

RAPHAEL URBAIN MASSARD, historical engraver.

DR. STANLEY, Bishop of Norwich, President of the Linnæan Society.

CHARLES LYELL, botanist.

SIR ISAMBERT BRUNEL, the well-known engineer of the Thames Tunnel.

EDWARD DOUBLEDAY, entomologist.

JOHN DUNCAN, traveller in Africa.

QUATREMERE DE QUINCY, the oldest member of the French Institute.

JAMES COWLES PRICHARD, M.D., ethnologist.

GEORGE FOWNES, Professor of Practical Chemistry at University College, London.

FRANCIS ENGLEHEART, engraver.

HARVEY EGINTON, architect and glass-painter.

CHARLES FOX, engraver and botanist.

SAMUEL MAUNDER, encyclopædian compiler.

WILLIAM RAE WILSON, traveller.

WILLIAM COOKE TAYLOR, LL.D. miscellaneous writer.

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